INSTALLATION AND OPERATION MANUAL

DXC-100PSX

N+1 Protection Switch

DXC-100 Version 16.2

RAD
data communications
The Access Company

DXC-100PSX

N+1 Protection Switch

DXC-100 Version 16.2

Installation and Operation Manual

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Chapter 1

Overview

1.1 Overview

Purpose and Use

The DXC-100PSX N+1 Protection Switch provides automatic backup for failed narrowband (D8E1T1) and/or broadband (DT3 or DE3) module sets in a DXC-100 Multiservice Access Node, whether used as a standalone or as part of a stack.

The backup is accomplished by providing a redundant (spare) module set within the DXC-100 of identical type as the primary module(s) being protected. Both the spare and primary modules are configured into protection groups, which are monitored by the System Manager module (DSMC.2 or DXNM). When the DSMC.2 determines that there is a problem with one of the primary modules and a switchover is required, it will configure the spare to match the defective primary module and will then command the DXIP to transfer the network traffic to the redundant module set, via interface relays. This design allows the link to resume operation without user intervention, and with only a minimal amount of downtime.

Note

*The generic term **SMC** is used to refer to either type of System Manager module, DSMC.2 or DXNM. The full designation is used when the information is applicable only to a specific module type.*

Main Features

The primary function of the DXC-100PSX N+1 Protection Switch is to allow a DXC-100 operated in a stack or as standalone to carry redundant Narrowband (D8E1T1) or Broadband (DT3 or DE3) module sets, which provides the user a backup capability in the event that a Broadband or Narrowband module becomes non-operational. With the DXC-100PSX in place, the non-operational module should be switched to a backup module. This allows the system to reconfigure links and continue operating with minimum down time and without any user intervention.

The following conditions will cause a switchover from the primary to the standby module:

- Front or rear card is not present
- Channel card encounters system fatal errors
- Channel card not receiving message from the SMC

- Mismatch between hardware and software shadow
- Missing cables
- Card problems such as:
  - Loss of communication
  - Loss of clock
  - Framer problems, etc.

Cooling System

DXC-100PSX has a three-speed cooling fan system. The system provides automatic speed change (auto-sensing temperature) or it can be controlled via the menu screen.

- Low: Always on unless forced off
- Med: turns on at 97°F
- High: turns on at 110°F
- Auto alarm notification when fan speeds slow down.

The N+1 Protection Switch is designed to be mounted above the DXC-100 chassis, and its cooling fan improves air flow through the DXC-100.

Software Updates

For software update procedures, refer to the *Utilities* chapter of the *DXC-100 Installation and Operation Manual*.

1.2 Physical Description

General

The following list explains specific terms used in this manual.

Term	Meaning
Broadband Group 1	Refers to the broadband cards that have been established in a redundant group and residing in slots 8, 9, 10, and 11. The standby card in this group must reside in slot 11.
Broadband Group 2	Refers to the broadband cards that have been established in a redundant group residing in slots 1, 2, 3, 4, 5, 6, and 7. The standby card in this group must reside in slot 7.
Broadband Primary Card	This card resides in the protection switch and is used to back up a broadband application module in slot 8, 9 or 10, and slots 1 through 6.

Term	Meaning
Broadband Redundant Card	This card resides in the protection switch and is used to back up a broadband application module; it must reside in slot 11 or 7.
Controller Card	Provides communications between the DXC-100 System Manager and the protection switch.
N+1 Device Redundancy (NDR)	A redundant device is provided to replace a failed primary device in a group.
N+1 Device Redundancy Group (NDRG)	A collection of configured primary devices and a redundant device that will be used for redundancy.
Narrowband Primary Card	This card resides in the protection switch and is used to back up a narrowband application module in slots 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11.
Narrowband Redundant Card	This card resides in the protection switch and is used to back up a narrowband application module; it must reside in slot 1.
Primary Device	A device in a redundancy group that would normally carry traffic.
Primary Slots (DXC-100)	Cards plugged into these slots are considered *active* and on-line under normal operation.
Primary Slots (Protection Switch)	Holds interface cards for the cards plugged into the DXC-100 primary slots.
Protected Device	This is a primary device that will be replaced by a redundant device should it fail within its redundancy group.
Redundant Device	One device in a redundancy group that has been configured to replace or substitute for a failed primary device in the redundancy group.
Restore	An action that occurs when traffic is returned to the primary device that was being protected in the redundancy group by a redundant device.
Standby Slots (DXC-100)	Cards plugged into these slots are considered inactive and off-line under normal operation. They become active and go on-line when a card plugged into the primary slot becomes non-operational.
Standby Slots (Protection Switch)	Holds interface cards for the cards plugged into the DXC-100 standby slots.
Switchover	An action that occurs when a redundant device replaces a primary device that failed.

Protection Switch Components

The DXC-100PSX, shown in *Figure 1-1* installed in its position over the protected DXC-100, contains:

- Eleven slots for ***Interface Cards*** - these cards provide the functionality to switch to the DXC-100 primary or redundant slot. They are physically connected via primary or standby adapter cables to the DXC-100. The Protection Switch network connections come into this card through the *Primary Adapter Cable*.
- One slot for the fail-safe ***Controller Card*** - provides communications between the DXC-100 System Manager and the Protection Switch. The Controller Card

and DXC-100 System Manager (DSMC.2) or Expansion Node Manager (DXNM) are connected via a DB9 serial interface cable.

- Two slots for the ***DC Redundant Power Supply***. The DC Power Supply has a range of 43.2V DC to 52.8V DC. Terminal blocks are used for DC power input.
- A fan assembly unit for auxiliary cooling.

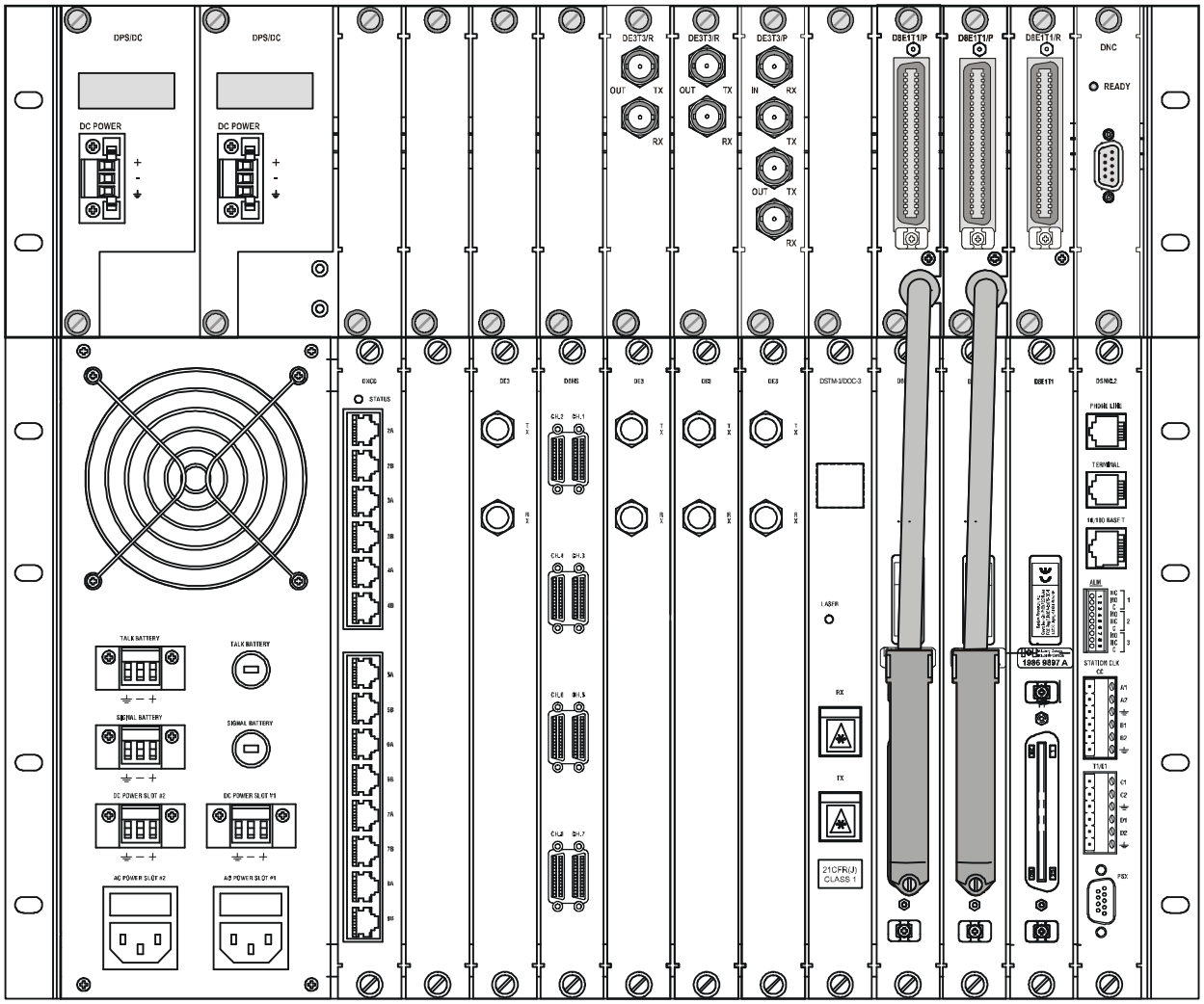


Figure 1-1. DXC-100PSX Protection Switch and DXC-100, Rear View

Indicators

There is only one indicator on the DXC-100PSX; it is a READY indicator that resides on the PSX Controller Module. See *Table 1-1* for indicator states and associated illumination criteria.

Table 1-1. DXC-100PSX Indicator (Controller Module)

Indicator	State	Description
READY	Flashing Green	Protection Switch is powered up and the PSX Controller is communicating with the System Manager Module (DSMC.2) in the DXC-100.
	Flashing Red	PSX Controller is powered up, but not communicating with the System Manager Module (DSMC.2) in the DXC-100.
	OFF	Protection Switch is not powered up or PSX Controller is not operational.

If the READY LED is alternately flashing between red and green, the PSX Controller Module is downloading software to memory.

DC Power Supply Module, DPC/DC

The DC Power Supply Module is designed to take -48VDC input power and use it to supply 24VDC for fan operation and 5VDC for digital logic and relay operation. The input power passes through a 2 Amp, 250V, fast acting fuse (designated as F1) and an inrush current limiter.

The DXC-100PSX can be configured with either a single DC Power Supply Module or optionally two power supplies for redundant operation. Two front-accessible, full-height power supply slots are provided in the DXC-100PSX chassis; a minimum of one power supply is required per DXC-100PSX nest.

Thumbscrews are provided at the top and bottom of the faceplate to secure the module in the chassis and to make an electrical connection to frame ground for regulatory emission compliance. See *Figure 1-2* for an illustration of a DC Power Supply Module.

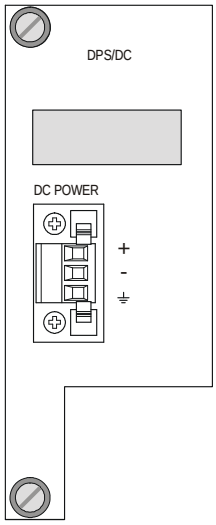


Figure 1-2. DC Power Supply Module

Each DC Power Supply Module has a single connector (with 3mm screw down terminals) to interface to the -48VDC external power source(s). Terminal polarity labeling is provided on the rear faceplate.

Note

This connector is identical to that utilized on the DXC-100 chassis DC power input.

Protection Switch Controller Module, DNC

The PSX Controller Module is used to manage the N+1 Protection switch, as well as connect it to the controlling DXC-100 resident System Manager (DSMC.2) or DXC-100 Expansion Node Manager (DXNM) Rear Card. It also manages the DXC-100PSX fan assembly and relay interface operations. The controller module is fail-safe so that if it stops operating due to a fault (such as loss of power or its removal), the DXC-100PSX resident latching relays will maintain their positions in a non-disruptive manner.

Note

For the DXC-100 stack configuration, a DSMC.2 (DXNM) interface module must be installed in each DXC-100 nest in order to connect the PSX Controller Module to the DXC-100 nest.

The DXC-100PSX supports a single controller module that is installed in the allocated slot; one controller module is required per nest. There is no provision for redundancy of the PSX controller since the system itself is fail-safe in that latching relays are employed. This means that the configuration prior to a potential controller failure will be maintained.

Thumbscrews are provided at the top and bottom of the faceplate to secure the module in the chassis and to make an electrical connection to frame ground for regulatory emission compliance. See *Figure 1-3* for an illustration of the Controller Module panel.

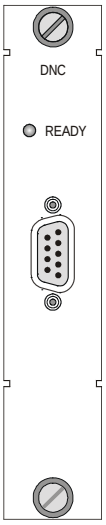


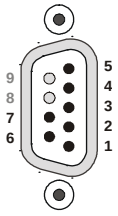
Figure 1-3. N+1 Protection Switch Controller Module

A single bi-color (green/red) LED is provided to indicate whether the controller module is powered and operating properly. See *Table 1-1* for the indicator states and associated illumination criteria.

The PSX Controller module directly interfaces the DXC-100 resident DSMC.2 or DXNM module sets via a DB-9 (EIA-232) 38.4 kbps asynchronous serial data link.

See *Table 1-2* for the connector configuration and associated pinouts.

Table 1-2. PSX Controller Module Connector Configuration and Pinouts

DB-9 Pin Locations	Pin	Signal
	1	DXC-100PSX Reset (current source)
	2	Data (to DXC-100PSX)
	3	Data (from DXC-100PSX)
	4	DXC-100PSX Present (current source)
	5	Ground
	6	DXC-100PSX Present (current sink - active low)
	7	DXC-100PSX Reset (current sink - active low)
	8	–
	9	–

Narrowband Primary Module, D8E1T1/P

The Narrowband Primary Module is designed to interface with a DXC-100 resident protected D8E1T1 interface module via the attached interconnection cable. This module is used to facilitate DXC-100 commanded interface switching from the protected module to the standby module (via latching relays). The Narrowband Primary Module must be installed in DXC-100PSX slots 2 through 11 as part of a Narrowband Protection Group. The protected D8E1T1 module set must be installed in a matching slot (slots 2 through 11) in the DXC-100 chassis.

Thumbscrews are provided at the top and bottom of the faceplate to secure the module in the chassis and to make an electrical connection to frame ground for regulatory emission compliance. See *Figure 1-4* for an illustration of a Narrowband Primary Module.

A single 50-pin (AMP 552725-1 telco-type) female receptacle is mounted on this module and is used to directly interface the narrowband network facilities in place of the identical DXC-100-resident D8E1T1 (primary) port interface, which is now interfaced via the integrated "elephant trunk" cable assembly.

See *Table 1-3* for the connector configuration and associated pinouts.

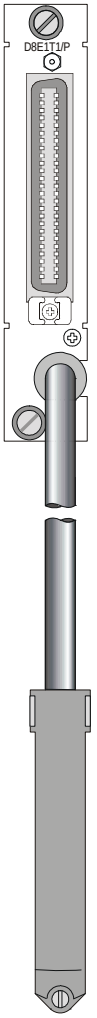
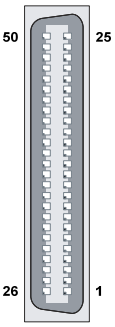


Figure 1-4. Narrowband Primary Module

Table 1-3. Narrowband Primary Module Connector Configuration and Pinouts

Pin Locations	Link	Transmit		Receive		Reserved	
		Tip	Ring	Tip	Ring		
	1	26	1	27	2	28	3
	2	29	4	30	5	31	6
	3	32	7	33	8	34	9
	4	35	10	36	11	37	12
	5	38	13	39	14	40	15
	6	41	16	42	17	43	18
	7	44	19	45	20	46	21
	8	47	22	48	23	49	24

Connector pins 25 and 50 are used to provide cable present status for inter-system cables between a given DXC-100PSX Narrowband Primary Module and its associated DXC-100 D8E1T1 interface module (i.e., not required for direct T1/E1 network interfaces).

Narrowband Redundant Module, D8E1T1/R

The Narrowband Redundant Module is designed to interface with the DXC-100 resident standby D8E1T1 interface module via a Telco-to-Telco type interconnection cable (provided). This module is used to facilitate DXC-100 commanded interface switching from the protected module to the standby module (via latching relays). The Narrowband Redundant Module must be installed in DXC-100PSX slot 1. The standby D8E1T1 module set must also be installed in the matching slot (slot 1) in the DXC-100 chassis.

Thumbscrews are provided at the top and bottom of the faceplate to secure the module in the chassis and to make an electrical connection to frame ground for regulatory emission compliance. See *Figure 1-5* for an illustration of a Narrowband Redundant Module.

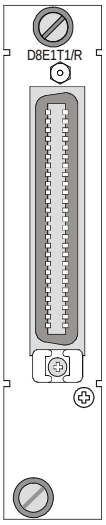
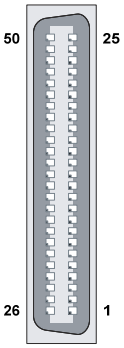


Figure 1-5. Narrowband Redundant Module

A single 50-pin (AMP 552725-1 telco-type) female receptacle is mounted on this interface module and is used to directly interface the identical DXC-100-resident D8E1T1 (redundant) port interface (i.e., there is no direct network interface for redundant modules). See *Table 1-4* for the connector configuration and associated pinouts.

Table 1-4. Narrowband Redundant Module Connector Configuration and Pinouts

Pin Locations	Link	Transmit		Receive		Reserved	
		Tip	Ring	Tip	Ring		
	1	26	1	27	2	28	3
	2	29	4	30	5	31	6
	3	32	7	33	8	34	9
	4	35	10	36	11	37	12
	5	38	13	39	14	40	15
	6	41	16	42	17	43	18
	7	44	19	45	20	46	21
	8	47	22	48	23	49	24

Connector pins 25 and 50 are used to provide cable present status for inter-system cables between a given DXC-100PSX Narrowband Redundant Module and its associated DXC-100 D8E1T1 interface module.

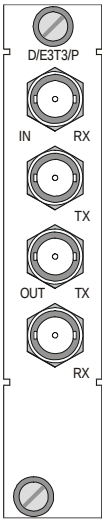
Broadband Primary Module, DE3T3/P

The Broadband Primary Module is designed to interface with a DXC-100-resident protected DT3 or DE3 interface module via a set of BNC interconnection cables. This module is used to facilitate DXC-100 commanded interface switching from the protected module to the standby module (via latching relays). The Broadband Primary Module must be installed in DXC-100PSX slots 1 through 6 for Broadband

Group 2 or in DXC-100PSX slots 8 through 10 for Broadband Group 1. The protected DT3 or DE3 module set must be installed in a matching slot (slots 1 to 6 or 8 to10) in the DXC-100 chassis.

Thumbscrews are provided at the top and bottom of the faceplate to secure the module in the chassis and to make an electrical connection to frame ground for regulatory emission compliance. See *Figure 1-6* for an illustration of a Broadband Primary Module.

Figure 1-6. Broadband Primary Module



Two sets of individual BNC (AMP 415085-1 locking bayonet-type) female receptacles (four total) are mounted on the Broadband Primary interface module with the IN pair interfacing the broadband facility and the OUT pair interfacing the associated DXC-100-resident module set.

See *Figure 1-7* for the IN and OUT connector configuration and labeling.

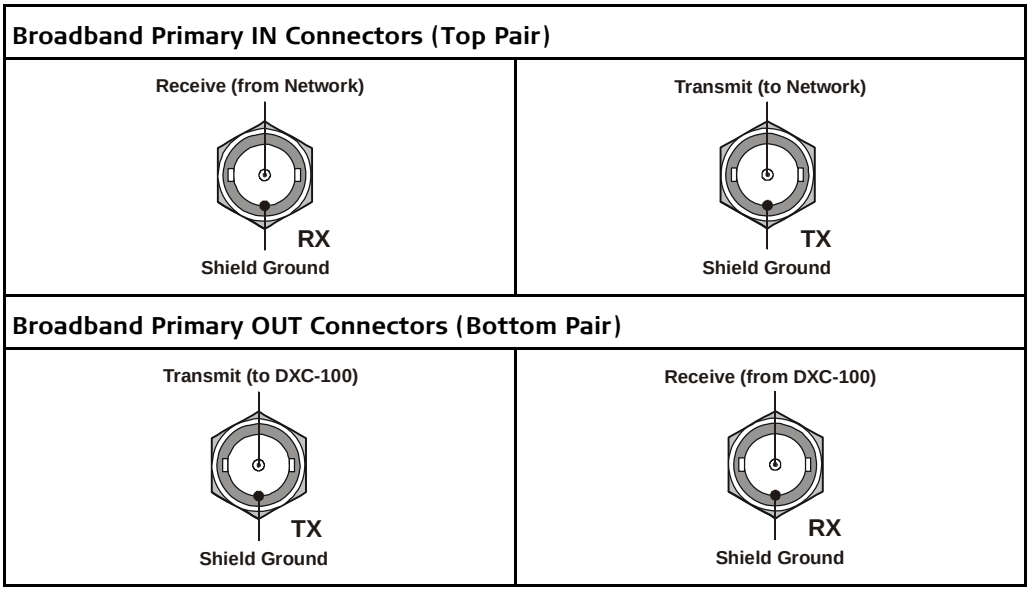


Figure 1-7. Broadband Primary Module BNC Connector Configuration and Pinouts

Broadband Redundant Module, DE3T3/R

The Broadband Redundant Module is designed to interface with the DXC-100-resident standby DT3 or DE3 interface module via a set of BNC interconnection cables. This module is used to facilitate DXC-100-commanded interface switching to the standby module from the protected module (via latching relays). The Broadband Redundant Module must be installed in DXC-100PSX slot 7 for Broadband Group 2, or in DXC-100PSX slot 11 for Broadband Group 1. The standby DT3 or DE3 module set must be installed in a matching slot (slot 7 or 11) in the DXC-100 chassis.

Thumbscrews are provided at the top and bottom of the faceplate to secure the module in the chassis and to make an electrical connection to frame ground for regulatory emission compliance. See *Figure 1-8* for an illustration of a Broadband Redundant Module.

Figure 1-8. Broadband Redundant Module

One set of individual BNC (AMP 415085-1 locking bayonet-type) female receptacles (two total) are mounted on the Broadband Redundant interface module with the OUT pair interfacing the associated DXC-100 resident module set.

See *Figure 1-9* for the OUT connector configuration and labeling.

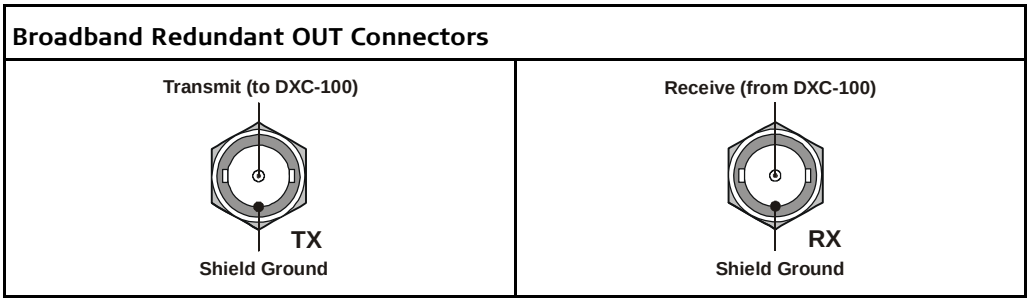


Figure 1-9. Broadband Redundant Module BNC Connector Configuration and Pinouts

Fan Assembly

The field-replaceable exhaust fan assembly removes the heated air from the DXC-100PSX enclosure as well as the associated DXC-100 nest. *Figure 1-10* shows the front-mounted fan assembly (containing three fan units) with the front cover removed.

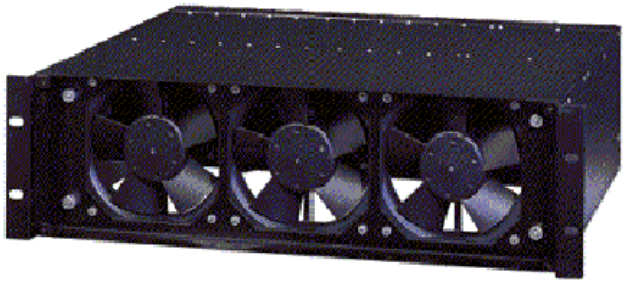


Figure 1-10. Fan Assembly (without Front Cover)

1.3 Functional Description

Broadband Redundancy

Broadband Normal Operation

During normal (non-fault) conditions, broadband user traffic to and from the network passes through the latching relays within the DXC-100PSX primary interface module which is directly attached to the link. If it is not already protecting another DXC-100 broadband module set within one of the two user defined broadband protection groups (BB1 supporting up to 3+1 or BB2 supporting up to 6+1 module redundancy), the redundant broadband module set will be performing self-test diagnostics via the looped back path within the DXC-100PSX redundant interface module.

In the event that a fault or failure is detected within the standby module set, that given broadband redundancy group will be disabled for the duration of the fault

condition. See *Figure 1-11* for an overview of the normal operation utilizing both BB1 (shown in black) and BB2 (shown in gray) redundancy groups.

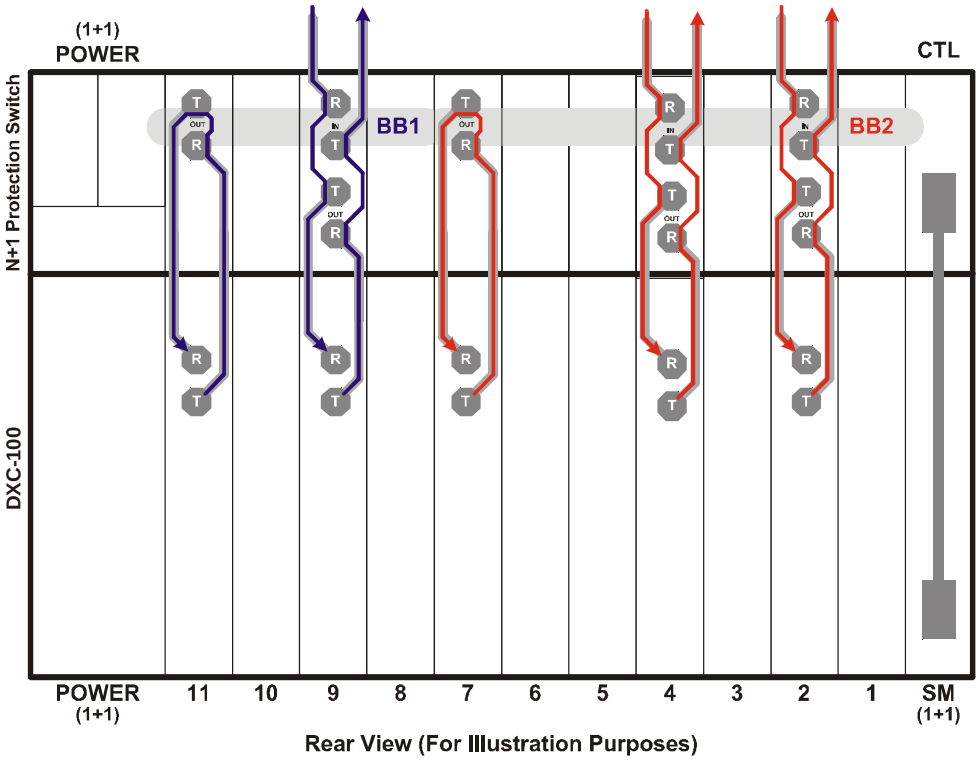


Figure 1-11. Broadband Normal Operation

Broadband Protection Mode Operation

In the event that a fault or failure is detected within a DXC-100 broadband primary module set, a system-level alarm will be issued and the DXC-100/DXC-100PSX broadband redundancy switching process will commence.

This process is as follows:

1. DSMC.2 (or DXNM) detects module-level fault or failure condition, such as:
   - Missing System Clock – DXC-100 16.384MHz clock signal not being received
   - Missing Frame Sync Pulse – Midplane TDM synchronization not being received
   - Invalid Fabric Timeslot – Module no longer interfacing fabric due to timeslot conflict
   - Incorrect Framer Values – Framer resident registers do not match shadow copy
   - Lost Supervisory Channel – System manager no longer communicating with module
   - Missing Front Module – Application module removed, lost power, or defective
   - Missing Rear Module – Interface module removed, lost power, or defective.

2. Redundant broadband module set (if in standby mode) receives configuration and crossconnect map information for the defective module from the DXC-100 system manager.
3. PSX controller module receives command from the DXC-100 system manager to transfer the broadband link (including all embedded T1/E1 links) to the redundant module in place of the failed broadband module set.
4. Redundant module will synchronize with the link and user traffic will be re-established.

See *Figure 1-12* for an overview of the protection operation where a fault is detected with the BB2 related DXC-100 module set located in slot 4 (BB1 group unaffected).

Once the original fault has been cleared or the defective module(s) replaced, the operator can command the DXC-100/PSX to restore the normal path (i.e., revertive restoration is not an automatic process by design).

Due to the N+1 nature of this module sparing scheme (versus 1+1 dedicated redundancy) this switchover requires a few seconds to complete in a worse case situation. The only situation that may go beyond this normal range is if the broadband module set ceases communications to the system manager via the supervisor channel. The capability to perform a commanded switchover for maintenance or upgrade purposes in less than 50 milliseconds is available.

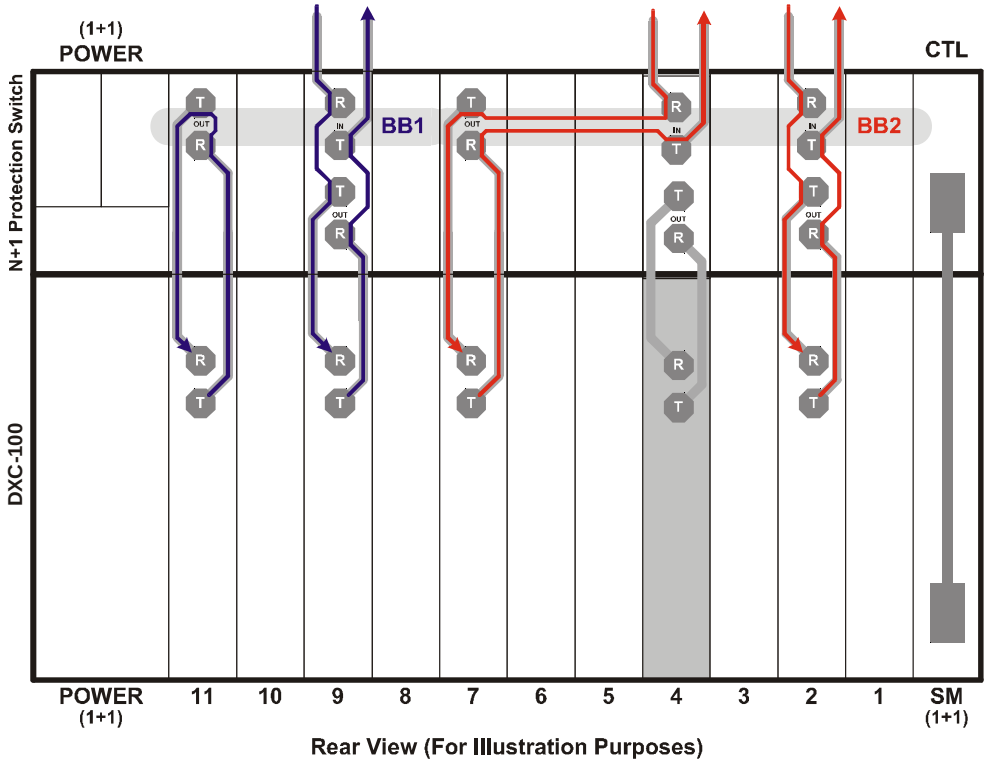


Figure 1-12. Broadband Protection Operation

See *Table 1-5* for a summary of typical total switchover times for different scenarios as measured on external test sets (i.e., total disruption time observed for given switchover criteria).

Table 1-5. Broadband Switchover Times

Error Type	Switchover Time
Missing System Clock	5 seconds
Missing Frame Sync Pulse	5 seconds
Invalid Backplane Timeslot Management	5 seconds
Incorrect Framer Values	1 second
Lost Communications with System Manager	60 seconds
Missing Application Module (Front Card)	20 seconds
Missing Interface Module (Rear Card)	5 seconds
Commanded Switchover	<50 milliseconds

Narrowband Redundancy

Narrowband Normal Operation

During normal (non-fault) conditions, narrowband user traffic to and from the network passes through the latching relays within the DXC-100PSX primary interface module which directly attaches to the link. If it is not already protecting another DXC-100 narrowband (D8E1T1) module set within the user defined narrowband protection, the redundant narrowband (D8E1T1) module set will be performing self-tests via the looped back path within the DXC-100PSX redundant interface module. In the event that a fault or failure is detected within the standby module set and narrowband redundancy will be disabled for the duration of the fault condition. See *Figure 1-13* for an overview of normal operation using the Narrowband Redundancy Group.

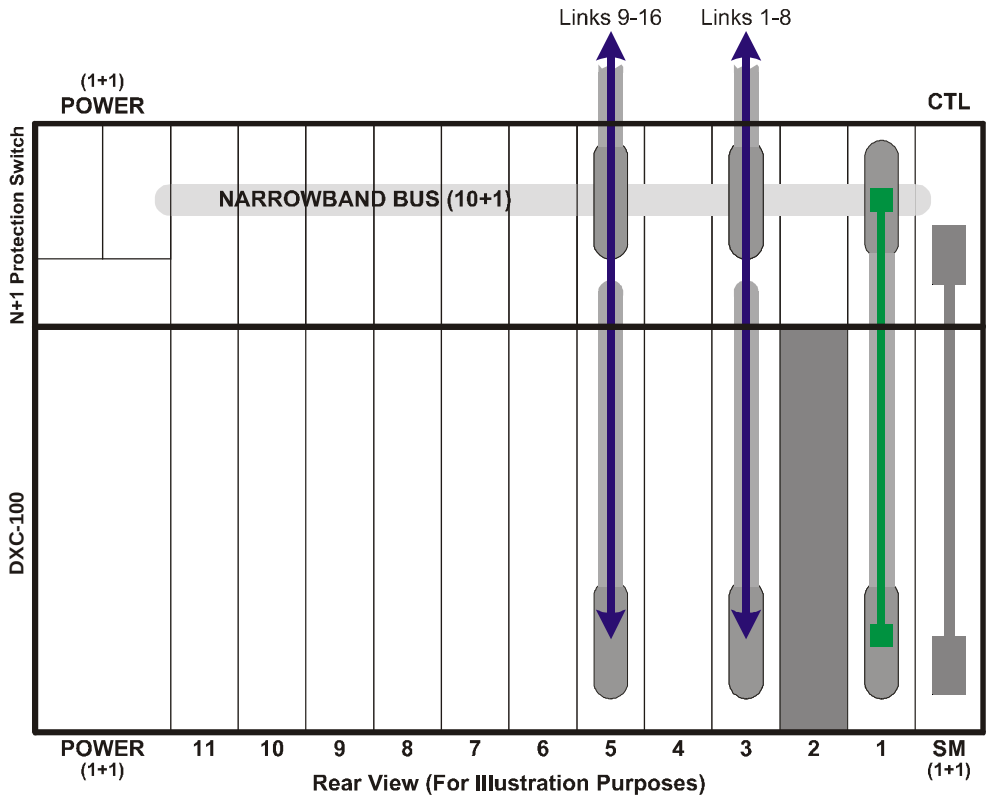


Figure 1-13. Narrowband Normal Operation

Narrowband Protection Operation

In the event that a fault or failure is detected within a primary DXC-100 narrowband module set, a system-level alarm will be issued and the DXC-100/DXC-100PSX narrowband redundancy switching process will commence.

This process is as follows:

1. DSMC.2 (or DXNM) detects module-level fault or failure condition, such as:
    - Missing System Clock - DXC-100 16.384MHz clock signal not being received
    - Missing Frame Sync Pulse - Midplane TDM synchronization not being received
    - Invalid Fabric Timeslot - Module no longer interfacing fabric due to timeslot conflict
    - Incorrect Framer Values - Framer resident registers do not match shadow copy
    - Lost Communications - System manager no longer communicating with module
    - Missing Front Module - Application module removed, lost power or defective
    - Missing Rear Module - Interface module removed, lost power or defective
    - Missing DXC-100/PSX Cable - D8E1T1 cable to DXC-100PSX primary interface module removed

2. Redundant narrowband (D8E1T1) module set (if in standby mode) receives configuration and cross-connect map information for the defective module from the DXC-100 system manager.
3. PSX controller module receives command from the DXC-100 system manager to transfer all eight links to the redundant module in place of the failed D8E1T1 module set.
4. Redundant module will synchronize with the links and user traffic will be reestablished.

See *Figure 1-14* for an overview of the protection operation using the Narrowband Redundancy Group.

Once the original fault has been cleared or the defective module(s) replaced, the operator can command the DXC-100/PSX to restore the normal path (i.e., revertive restoration is not an automatic process by design).

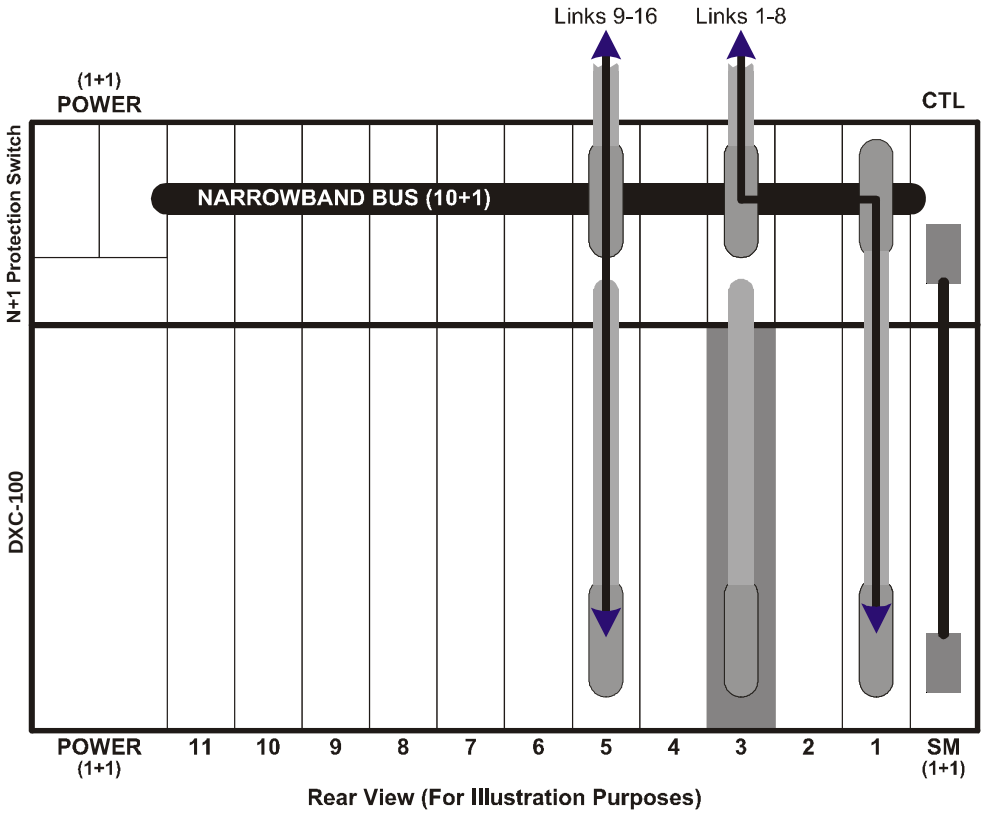


Figure 1-14. Narrowband Protection Operation

Table 1-6. Narrowband Switchover Times

Error Type	Switchover Time
Missing System Clock	~5 seconds
Missing Frame Sync Pulse	~5 seconds
Invalid Backplane Timeslot Management	~5 seconds
Incorrect Framer Values	~1 second
Lost communications with System Manager	~60 seconds
Missing Application Module (Front Card)	~1 second
Missing Interface Module (Rear Card)	~5 seconds
Missing DXC-100/DXC-100PSX Cable	~1 second
Commanded Switchover	< 50 milliseconds

1.4 Technical Specifications

General

Configuration
- Can be configured with a standalone DXC-100 chassis
- Can be configured in a DXC-100 stack node

Certifications — FCC Part 15 and Part 68, IC, UL1950, IC CSO3, IC-003, EN60950, EN55022, EN50082, NEB/L3, CTR 12/13, CB Scheme

Power Supply — -48VDC ±10%, max. 48W

Slots — 11 primary/redundant module slots, plus 2 power supply slots and 1 controller slot

Dimensions — 133 mm (5.25") H (3 RU) x 432 mm (17") W x 356 mm (14")

Weight — 12.5 kg (27.5 lbs) fully loaded

Mounting — Rack mount (19" or 23") Flush or Center Mount

Input Power — -48 VDC ±10%, Max. 48 Watts

Fuse — F1 (in DC Power Supply Module): 2 Amp, 125V, Fast Acting

Environment — Temperature: 0° (32°F) to 50°C (122°F)

Humidity: 0% to 90% (non-condensing)

DC Power Supply Module	*Physical Dimensions*	133 mm H (5.25″) x 235 mm (9.25″) D x 53 mm (2″) W
	Functionality	Provides DC power for DXC-100PSX
	Nominal Input Voltage	-48 VDC
	Connector	3-position panel-mounted header (Phoenix 07-07-25-1) and terminal strip/plug (Phoenix 17-57-02-2)
	Fuse	F1 (on printed circuit board): 2A, 125V, fast-acting
PSX Controller Module	*Physical Dimensions*	133 mm (5.25″) H x 220 mm D x 26 mm (1″) W
	Functionality	Control
	Nominal Input Voltage	Serial asynchronous data
	Connector	DB9 serial connector on faceplate
Narrowband Primary Module, D8E1T1/P	*Physical Dimensions*	133mm H x 222mm D x 26mm W
	Functionality	Narrowband redundancy (T1 or E1)
	Nominal Input Voltage	T1 (100Ω) or E1 (120Ω)
	Connectors	• 50-pin, RJ48F connector on faceplate: T1 (100Ω) or E1 (120Ω) • 50-pin, RJ48M connector on attached cable T1 (100Ω) or E1 (120Ω)
Narrowband Redundant Module, D8E1T1/R	*Physical Dimensions*	133mm H × 222mm D × 26mm W
	Functionality	Narrowband Redundancy for D8E1T1 Module
	Nominal Input Voltage	T1 (100Ω) or E1 (120Ω)
	Connector	50-pin, RJ48F connector on faceplate: T1 (100Ω) or E1 (120Ω)
Broadband Primary Module, DE3T3/P	*Physical Dimensions*	133 mm H (5.25″) x 235 mm (9.25″) D x 26 mm (1″) W
	Functionality	Broadband redundancy for DT3 or DE3 modules
	Nominal Input Voltage	T3, STS1, or DE3
	Connector	4 female BNC (75Ω) on faceplate - 1 transmit, 1 receive

Broadband Redundant Module, DE3T3/R	*Physical Dimensions*	133 mm H (5.25″) x 235 mm (9.25″) D x 26 mm (1″) W
	Functionality	Broadband redundancy for DT3 or DE3 modules
	Nominal Input Voltage	DT3 or DE3
	Connector	2 female BNC (75Ω) on faceplate - 2 transmit, 2 receive
Fan Assembly	*Functionality*	Removes heated air from DXC-100PSX and DXC-100 units
	Maximum Airflow	100 cfm per fan (3 fans)
	Noise Level	45 dBA per fan (3 fans)

Chapter 2

Module Installation and Operation

2.1 Installing and Connecting the Protection Switch

This section will guide you through installing the DXC-100PSX N+1 Protection Switch, installing modules, and configuring Network Redundancy.

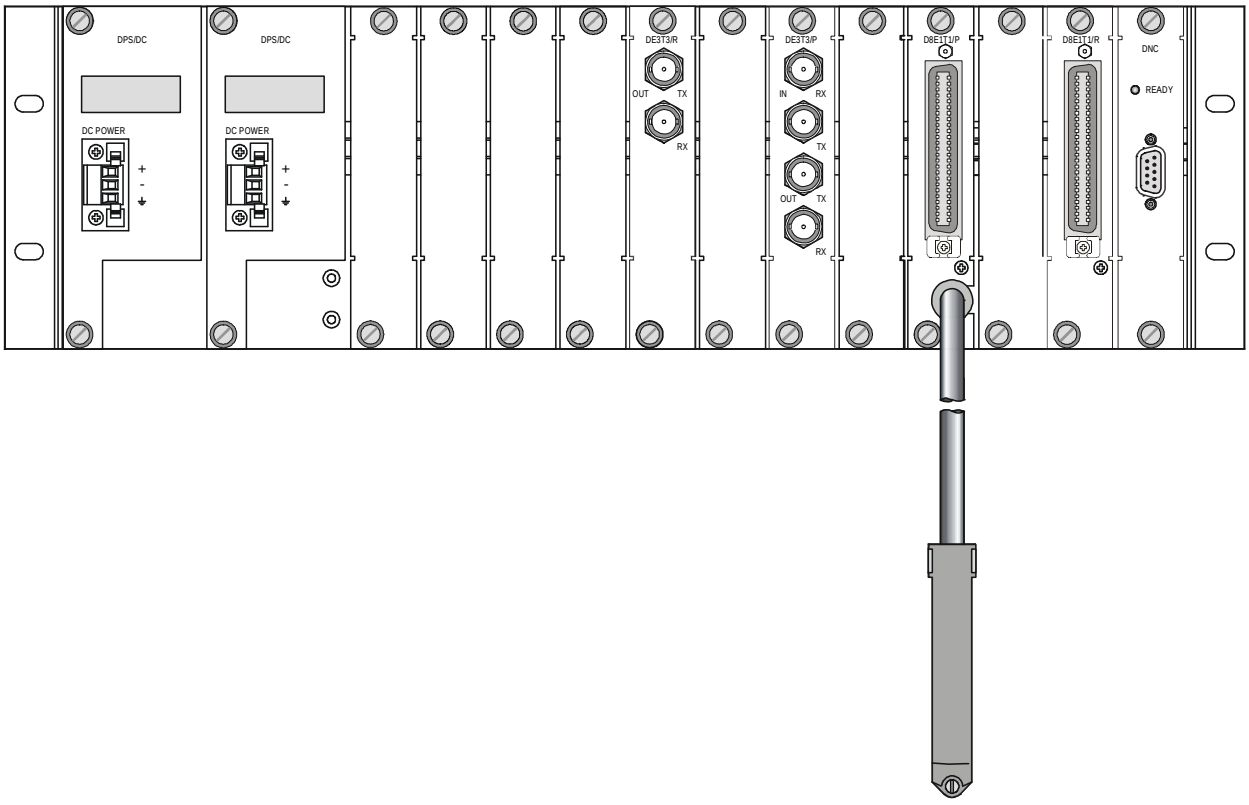


Figure 2-1. N+1 Protection Switch (Rear View)

Ensure that you have 3RU (5.25"/133mm) of empty rack space above the DXC-100 unit in which to install the N+1 Protection Switch.

1. Securely mount the N+1 Protection Switch in the equipment rack, directly above the DXC-100.
2. Connect the DB9 male-to-male serial interface cable to the DB9 connector on the PSX Controller module. See *Figure 1-3* for connector location.

3. Connect the opposite end to the DB9 connector located on the DSMC.2 rear interface module, marked **PROTECT SWT.**
4. Install the primary and redundant interface modules.

ESD Caution

The DXC-100PSX Primary and Redundant Interface Module components are sensitive to electrostatic discharge. When handling these modules, wear an anti-static wrist strap connected to frame ground to prevent damage to circuits from electrostatic discharge.

Note

The Primary and Redundant Interface modules have a one-to-one correspondence with the DXC-100 Interface modules; see Table 2-1.

Table 2-1. One-to-One Correspondence

Slot	Module
Slot 1	Narrowband Redundant Card, D8E1T1/R
Slots 2 to 11	Narrowband Primary Card, D8E1T1/P
Slot 11	Broadband Redundant Card, DE3T3/R
Slots 8 to 10	Broadband Primary Card, DE3T3/P
Slot 7	Broadband Redundant Card, DE3T3/R
Slots 1 to 6	Broadband Primary Card, DE3T3/P

Narrowband Redundancy Connections

1. Connect the 50-pin cable from the network to the 50-pin connector on the DXC-100PSX Narrowband Primary module.
5. Connect the 50-pin cable from the Narrowband Primary module to the corresponding 50-pin connector on the DXC-100 Narrowband (D8E1T1) rear interface module.
6. Attach the 50-pin male-to-male cable (CBL-100PSX-D8E1T1) from the Narrowband Redundant module to the Standby slot 1 on the DXC-100.

Figure 2-2 illustrates a DXC-100PSX connection for Narrowband Redundancy.

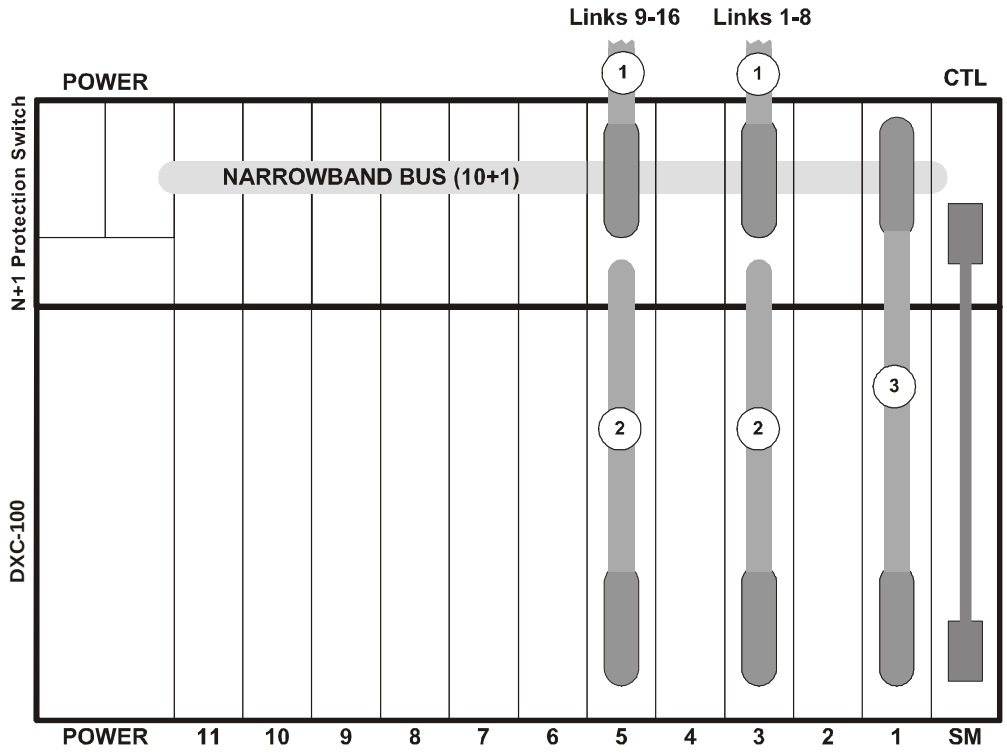


Figure 2-2. DXC-100PSX Narrowband Cable Installation

Note *In the above figure, slots 3 and 5 contain Narrowband primary interface modules, and slot 1 contains the Narrowband Group backup module. The numbers on the cables correspond to the steps in the Narrowband Connection procedure above.*

Note

To power up, refer to Connecting N+1 Protection Switch DC Power (-48VDC) *on page 2-4*.

Broadband Redundancy Connections

1. Connect the RX BNC cable from the network to the "IN" RX jack on the DXC-100PSX Broadband Primary module and the TX BNC cable to the network to the "IN" TX jack.
2. Connect one of the BNC attachment cables (CBL-100PSX-DE3T3) between the DXC-100PSX Primary "OUT" TX and the RX port of the corresponding broadband interface module in the DXC-100.
3. Connect another BNC attachment cable (CBL-100PSX-DE3T3) between the DXC-100PSX Primary "OUT" RX and the TX port of the corresponding broadband interface module in the DXC-100.
4. Connect another BNC cable (CBL-100PSX-DE3T3) between the RX port of the DXC-100PSX Broadband Redundant module and the TX port of the corresponding backup broadband interface module in the DXC-100.

5. Connect another BNC cable (CBL-100PSX-DE3T3) between the TX port of the DXC-100PSX Broadband Redundant module and the RX port of the corresponding backup broadband interface module in the DXC-100.

Figure 2-3 illustrates a DXC-100PSX connection for Broadband Redundancy.

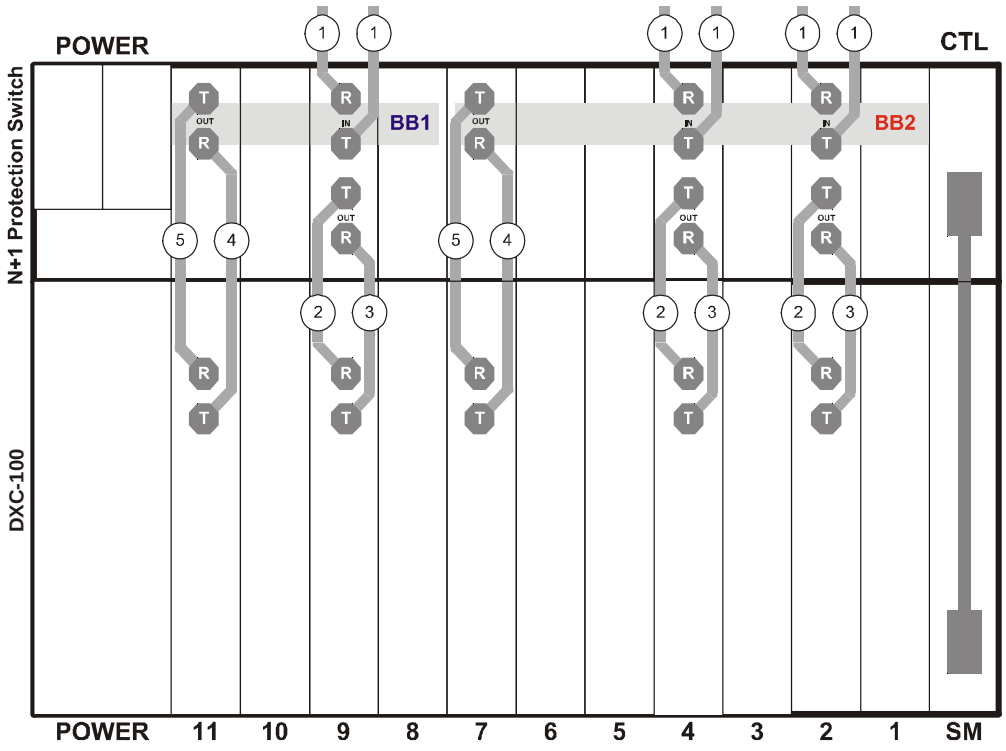


Figure 2-3. DXC-100PSX Broadband Cable Installation

Note

In the above figure, slot 9 contains a Broadband Group 1 primary interface module, and slot 11 contains the Broadband Group 1 backup module. Slots 2 and 4 contain Broadband Group 2 primary interface modules, and slot 7 contains the Broadband Group 2 backup module. The numbers on the cables correspond to the steps in the Broadband Connection procedure on the previous page.

Note

To power up, refer to Connecting N+1 Protection Switch DC Power (-48VDC) below.

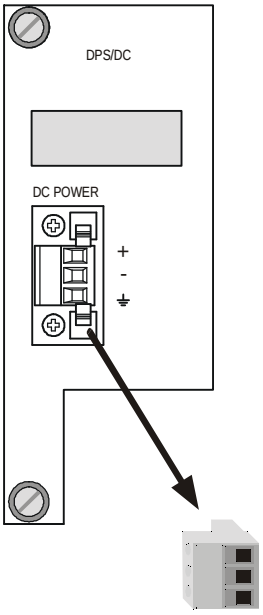
Connecting N+1 Protection Switch DC Power (-48VDC)

Note

To ensure DC power redundancy is maintained, use two DC Power Supply Modules, in conjunction with power sources from two separate fuse panels or from a fuse panel with redundant (A and B) fuse positions.

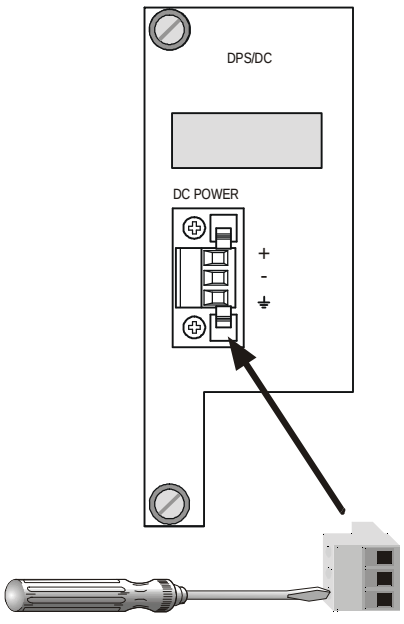
1. Mount the unit above a DXC-100 unit in a rack as specified previously.
2. Shut off -48VDC power to the DC supply leads.
3. Strip the insulation back approximately 5/16 inch (8 mm) from the end of each lead.
4. Note the positions of earth, negative and positive on the DC power plug (designations are on the DC Power Supply Module faceplate).
5. Remove the DC power terminal block from the mating receptacle on the DC Power Supply Module faceplate (see *Figure 2-4*).

Figure 2-4. Remove Power Terminal Block



6. Insert the "earth" lead into the earth terminal clamp on the power terminal block and tighten the clamp screw using a small flat screwdriver (see *Figure 2-5*).

Figure 2-5. Connecting DC Power Leads



7. Insert the "-48 volt supply" wire into the negative terminal clamp and tighten the clamp screw.
8. Insert the "return" wire into the positive terminal clamp and tighten the clamp screw.
9. Insert the power terminal block into the mating receptacle on the rear panel (see *Figure 2-5*).
10. Repeat Steps 2 to 9 if the DXC-100PSX has a second (redundant) DC Power Supply Module installed.
11. To minimize disturbance to the wires through casual contact, secure the power cables to the rack frame using multiple cable ties. The first tie should be located within 6 inches of the terminal block.
12. Power up both the DXC-100 and N+1 Protection Switch. The LED on the PSX Controller Module will flash as the unit powers up, loads software, and runs a self-test. This will take a few minutes, depending upon how many modules have been configured.
13. Once the system is powered up, you should see a flashing **Green** *READY* LED on the N+1 Protection Switch Controller module; a solid **Green** *READY* LED on the online DSMC.2; and a flashing **Green** *READY* LED on the Standby DSMC.2.

Note

Ignore any alarms at this point.

Chapter 3

Configuration Instructions

3.1 Verifying Protection Switch Installation

To ensure that the Protection Switch has been properly installed, verify the Card Status is *Ok* and the Switch State's condition is *Normal.*

Note

For detailed craft terminal operating instructions refer to the DXC-100 Installation and Operation Manual.

➤ To verify the protection switch installation:

1. From the DXC-100 Main Menu, move your cursor to the *Nest Summary* field and press <Enter> The Nest Summary Menu appears:

```
Standby SMC not present                          N+1 Redundancy State: Enabled
Alarm Contacts..: Enabled                        Alarm Contact Type..: Standard
Nest #1 Slot Summary Menu
       N+1
Slot#  Group  Configured Type    Device State   Alarm
-----  -----  --------------    ------------   -----
01             Octal T1/E1       Standby        None         Clock Src
02             Octal T1/E1       Online         None
03             Octal T1/E1       Online         None
04             Octal T1/E1       Online         None
05             Octal T1/E1       Online         None
06             Hybrid DS-3       Online         None
07             Hybrid DS-3       Standby        None
08             STS-1             Online         None
09             STS-1             Online         None
10             Hybrid DS-3       Online         None
11             Hybrid DS-3       Standby        None
SMCA           System Manager A  Standby        None
SMCB           System Manager B  Online         None
PSX            ProtectionSwitch  Online         None

[C]lear error counts  [T]oggle Alarm Contacts

N+1 Device Redundancy: Switch[O]ver  [R]estore  [E]xpose
```

Figure 3-1. Nest Summary Menu

2. Verify that the Protection Switch is *Online* by looking in the device state column. Move your cursor to the *DXC-100PSX* field and press <Enter>. The

Protection Switch Status Menu appears: it should look similar to the one shown in *Figure 3-2*.

```
                                Status Menu
                                 ----------

 Slot#  Card Type                Card Status    Switch State   Switch Status
 ------------------------------------------------------------------------------
-
 01     Narrowband Redundant     Ok             Normal         Ok
 02     Narrowband Primary       Ok             Normal         Ok
 03     Narrowband Primary       Ok             Normal         Ok
 04     Narrowband Primary       Ok             Normal         Ok
 05     Narrowband Primary       Ok             Normal         Ok
 06     Broadband '2' Primary    Ok             Normal         Ok
 07     Broadband '2' Redundant  Ok             Normal         Ok
 08     Broadband '1' Primary    Cable Missing  Normal         Ok
 09     Broadband '1' Primary    Ok             Normal         Ok
 10     Broadband '1' Primary    Ok             Normal         Ok
 11     Broadband '1' Redundant  Ok             Normal         Ok

Power Supply A Status.: Ok        Fan Maintenance: Auto     Fan #01: Ok
Power Supply B Status.: Fault     Fan Speed......: Low      Fan #02: Ok
Chassis Temperature...: 85 F/29 C                           Fan #03: Ok
```

Figure 3-2. Protection Switch Status Menu

To expose additional information about the Protection Switch, go back to the Nest Summary Menu, and at the *DXC-100PSX* field, press the **E** key. The resulting screen should look similar to the one shown in *Figure 3-3*.

```
                        Protection Slot Information


 ----------------------------------------------  ----Major Alarms---
 Device........: Online                          Power Supply A: Ok
 Psx Controller: Rev #0                          Power Supply B: Ok
 Chassis.......: Undetermined                    Fan 1.........: Ok
                                                 Fan 2.........: Ok
                                                 Fan 3.........: Ok


PSX Interface Card Alarms
 01=None     02=None     03=None     04=None     05=None     06=None
 07=None     08=None     09=None     10=None     11=None
```

Figure 3-3. Protection Switch Slot Information Display

The screen above shows the Protection Switch is online, and operating with the Rev. 0 Controller Module. In this case, the chassis is *'Undetermined* because a

Rev. 0 Controller Module cannot determine the chassis type. In order to enable a second broadband group, go to the *Nest Profile Menu,* which is displayed on the following page. The information contained on the Protection Slot Information Display is listed in *Table 3-1*.

Table 3-1. Protection Slot Information Display Field Descriptions

Field	Description
Device: (display field)	Displays the state of the DXC-100PSX as Online or Offline.
Psx Controller: (display field)	Displays the revision level of the PSX Controller Module.
Chassis: (display field)	Displays the type of chassis as DXC-100PSX.
Power Supply A or B: (display field)	Displays the status of Power Supply A or B as one of the following: • Ok • Fault

Table 3-2. Protection Slot Information Display Field Descriptions

Field	Description
Fan 1, **2**, or **3:** (display field)	Displays the status of Fan 1, 2, or 3 as one of the following: • Ok – Fan is operating properly. • Fault – Fan has been shut off, or is otherwise inoperative.
DXC-100PSX Interface Card Alarms: (display field)	Displays the status of each of the 11 slots in the DXC-100PSX.

```
                    Nest #1 : Profile

          Nest name: Node Mgr. Unit I
          Nest type:.............................: DXC-100
          Dual System Mgr........................: No
          Alarm Contacts Type....................: Standard
          Dual XCC...............................: Yes
          Number of Rings for Modem Auto-Answer..: 2
          Nest Dual Power Supplies...............: No

          N+1 Redundancy Nest....................: Yes
          Protection Switch Dual Power...........: No
          N+1 Redundancy Narrowband Group........: Octal T1/E1
          N+1 Redundancy Broadband Group 1.......: HDS-3
          Protection Switch Dual Broadband Groups: Yes
          N+1 Redundancy Broadband Group 2.......: HDS-3
```

Figure 3-4. The Nest Profile Menu

Carefully read each field on this menu, and set up your system based on your equipment and software. If you have redundancy, select ***Yes*** on the N+1 Redundancy Node field. If you want to enable a second broadband group, select

Yes at the Protection Switch Dual Broadband Groups field. A new field, N+1 Redundancy Broadband Group 2, will appear. Establish which broadband devices you want to include for *Broadband Group 1* and *Broadband Group 2*.

If you have a Rev 0 Controller Module and the DXC-100PSX 2.3 software, you will need to specify DXC-100PSX chassis in order for your system to support the second broadband bus. Now, go back to the Nest Summary Menu. At the Protection Switch field, press **E** to expose the Protection Switch slot information. The Chassis field will show *'Determined'* as long as you selected DXC-100PSX.

3.2 Setting Up a Redundancy Group

Each primary card contains its own configuration file; the redundant card contains the configuration files downloaded from the card it will protect. The make up of a Redundancy Group is user-configurable. Currently, the DXC-100 implements two types of Redundancy Groups:

- *Narrowband Redundancy Group* (and displayed in the menus as *Nb*) for D8E1T1 modules in the node
- *Broadband Redundancy Group* (and displayed in the menus as *Bb-1* or *Bb-2*) for DT3 or DE3 modules in the node.

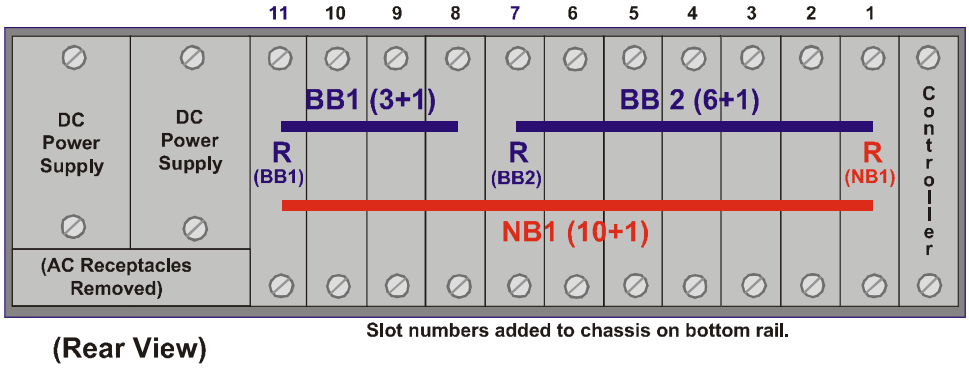


Figure 3-5. Network Device Redundancy Groups

3.3 Setting Up Multiple NDRGs

While portions of the broadband and narrowband redundancy groups are mutually exclusive, you can set up combinations of both broadband and narrowband NDRGs, as well as multiple broadband NDRGs.

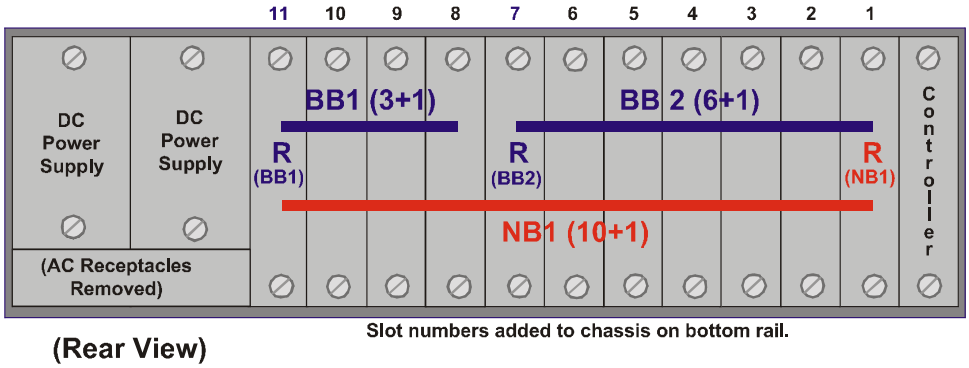


Figure 3-6. Rear View of DXC-100PSX showing possible Narrowband and Broadband NDRGs

Up to three NDRGs (i.e., any combination of broadband and narrowband) can be set up in the DXC-100 nest, see illustration above:

- The narrowband devices can reside in slots 1 to 11, with slot 1 holding the narrowband redundant device
- Broadband group 1 devices can reside in slots 8 to 11, with slot 11 holding the broadband redundant device
- Broadband group 2 devices must reside in slots 1 to 7, with slot 7 holding the broadband redundant device.

Again, all primary slots must be configured and enabled in order for the switchover to occur. The allowed combinations of redundancy groups and their slots are listed in *Table 3-3*.

Table 3-3. Possible Redundancy Group Combinations

Redundancy Group	Primary Slots	Primary Slot(s)	Standby Slot
Nb	10	2 to 11	1
Bb-2	6	1 to 6	7
Bb-1	3	8 to 10	11
Nb Bb-1	6 3	2 to 7 8 to 10	1 11
Nb Bb-2	4 1	2 to 5 6	1 7
Nb Bb-2 Bb-1	4 1 3	2 to 5 6 8 to 10	1 7 11
Bb-2 Bb-1	6 3	1 to 6 8 to 10	7 11

Key:
Nb Narrowband Group
Bb-2 Broadband Group 2
Bb-1 Broadband Group 1

Note

If a primary device in an Redundancy Group is being protected by a redundant device, do not remove it from the group if a switchover has occurred.

Setting up a Narrowband Redundancy Group

A Narrowband Redundancy Group can contain up to ***eleven*** configured narrowband devices. These devices reside in ***slots 1 through 11***. It is not necessary to have all narrowband devices in the nest be part of the Narrowband Redundancy Group. Narrowband devices not configured as part of the Redundancy Group *will not* be part of the Redundancy Group by default. You must *actually configure* the device to be part of the Redundancy Group.

The Narrowband Redundancy Group can contain only one redundant device, which must reside in ***Slot 1***. If the redundant device is not in Slot 1, or has not been configured as a part of the Redundancy Group or enabled, then the Redundancy Group switchover *will not* occur.

It is important to note here that there is no priority structure to an Redundancy Group. In other words, the first primary card in the Redundancy Group to fail is the one that will be switched. Should another primary card in the Redundancy Group fail while the redundant card is in use, *another switchover will not take place*.

To establish a Narrowband Redundancy Group, you must go to the Slot Configuration Menu. Refer to the *System Configuration* chapter in the DXC-100 User Guide for specific details on configuring a slot. Configure Slot 1 for the narrowband redundant device; and configure slots 2 through 11 with narrowband primary devices.

Note

You do not have to configure every slot in the DXC-100 nest with narrowband devices, but note that any device other than a narrowband device will not be recognized as part of that Redundancy Group, and therefore is not protected.

Configuring a Narrowband Redundancy Group is detailed on the following pages.

Configure a Narrowband Redundancy Group

1. From the DXC-100 Main Menu, select *System Configuration*, then select *Nest Profile*. The following menu appears:

```
                    Nest #1 : Profile

 Nest name: Node Mgr. Unit I
 Nest type:.............................: DXC-10011
 Dual System Mgr........................: Yes
 Alarm Contacts Type....................: Standard
 Dual XCC...............................: Yes
 Number of Rings for Modem Auto-Answer..: 2
 Nest Dual Power Supplies...............: No

 N+1 Redundancy Nest....................: Yes
 Protection Switch Dual Power...........: No
 N+1 Redundancy Narrowband Group........: Octal T1/E1
 N+1 Redundancy Broadband Group 1.......: HDS-3
 Protection Switch Dual Broadband Groups: Yes
 N+1 Redundancy Broadband Group 2.......: HDS-3
```

Figure 3-7. The Nest Profile Menu

3. Carefully read each field on this menu, and set up your system based on your equipment and software. To enable redundancy, select *Yes* on the *N+1 Redundancy Nest* field. *Octal T1/E1* (*D8E1T1*) will be the *N+1 Redundancy Narrowband Group* type, which is currently the only Narrowband Group type available. Configure the Broadband Redundancy Group(s) as appropriate to your application module configuration.

4. Go back to the DXC-100 Main Menu and select *System Configuration*, then select *Slot Configuration*. The following menu appears:

```
                    Nest #1 Slot Configuration Menu

      Slot#    Device Type          Name       Redundancy
      -----    ---------------      ------     ------------
      1        Octal T1/E1                      Disable
      2        Octal T1/E1                      Disable
      3        Octal T1/E1                      Disable
      4        Octal T1/E1                      Disable
      5        Octal T1/E1                      Disable
      6        HDS-3                            Disable
      7        HDS-3                            Disable
      8        STS1                             Disable
      9        STS1                             Disable
      10       HDS-3                            Disable
      11       HDS-3                            Disable


      N+1 Redundancy Switchover:  Automatic
      N+1 Redundancy Restore:     Manual

  Change Card = [Enter key]   [D]elete Card   [P]ort/Link Cfg
```

Figure 3-8. Slot Configuration Menu

5. Position the cursor next to the slot you want to configure and press **<Enter>**. The following menu appears:

```
                        Slot Configuration

                      Nest.............: 1
                      Slot.............: 1
                      Slot Name.......: New York
                      Card Type.......: Octal T1-E1
                      Redundancy...: Disable
```

Figure 3-9. Individual Slot Configuration Screen

6. Move your cursor to the *Slot name* field and press **<Enter>**, type in a slot name, and press **<Enter>** again. In the above example, *New York* is the named slot.
7. Move your cursor to the *Card type* field and press **<Enter>** to scroll through the card options until the desired card appears. In the case of a Narrowband Group, select *Octal T1/E1 (D8E1T1)*.
8. Move your cursor to the *Redundancy* field and press **<Enter>** until *Enable* is displayed.

Note *To enable redundancy for the Narrowband Redundancy Group you must have selected Octal T1/E1 as the card type.*

9. To exit and save changes, press **X**. When prompted: "Update Configuration? Are you sure? (Y/N)" press **Y**. You are returned to the Slot Configuration Menu.

Narrowband Redundant Device

View Information on the Narrowband Redundant Device in Slot 1

1. From the DXC-100 Main Menu, select *Nest Summary.* The following menu appears:

```
Standby SMC not present                        N+1 Redundancy State: Enabled
Alarm Contacts..: Enabled                      Alarm Contact Type..: Standard
Nest #1 Slot Summary Menu
       N+1
Slot#  Group  Configured Type    Device State    Alarm
-----  -----  ---------------    ------------    -----
01     Nb   + Octal T1/E1        Online          *None       Clock Src
02     Nb   - Octal T1/E1        Standby         *Major
03     Nb   + Octal T1/E1        Online           None
04     Nb   + Octal T1/E1        Online           None
05     Nb   + Octal T1/E1        Online           None
06     Bb-2 + Hybrid DS-3        Online           None
07     Bb-2 + Hybrid DS-3        Standby          None
08            STS-1              Online           None
09            STS-1              Online           None
10     Bb-1 + Hybrid DS-3        Online           None
11     Bb-1 + Hybrid DS-3        Standby          None
SMCA          System Manager A   Standby          None
SMCB          System Manager B   Online           None
PSX           ProtectionSwitch   Online           None

[C]lear error counts   [T]oggle Alarm Contacts
N+1 Device Redundancy:  Switch[O]ver   [R]estore   [E]xpose
```

Figure 3-10. Nest Summary Menu

10. Position your cursor on slot 1 and press **<Enter>**. The following menu appears:

```
                              Main Menu
                             -----------

Protected Slot: 02

                           View Configuration
                           Diagnostics
                           Utilities
                           N+1 Redundancy
                           About
```

Figure 3-11. D8E1T1 Secondary Device

Since slot 1 is established as the redundant device, it is only viewable as a status screen.

As you can see from the D8E1T1 device's Main Menu (*Figure 3-11*), a switchover has occurred and the D8E1T1 redundant device is protecting the D8E1T1 primary device resident in slot 2. If a switchover had not occurred, the *Protected Slot* field would read *"none"*. Consequently, if you displayed the slot information for a primary device configured in a Narrow- band Redundancy Group, the *Protected Slot* field would not be there.

From the screen shown in *Figure 3-11*, you can view the device's configuration, access utilities, view the redundancy state, and display module identification. With the exception of viewing the redundancy state, you can go to the relevant narrowband or broadband application module chapter to learn more about the *View Configuration, Diagnostics, Utilities,* and the *About* sub- menus and their functionality.

The *N+1 Device Redundancy* submenu can be accessed from both the device's *Main Menu* and the *Diagnostics* submenu.

Setting Up a Broadband Redundancy Group

The Broadband Redundancy Group can contain up to ***eleven*** configured broadband devices. These devices reside in ***slots 8 through 11*** for Broadband Redundancy Group 1, and in ***slots 1 through 7*** for Broadband Redundancy Group 2. Like the Narrowband Redundancy Groups, it is not necessary to have all broadband devices in the nest be part of a Broadband Redundancy Group. broadband devices not configured as part of the Redundancy Group *will not* be part of the Redundancy Group by default. You must a*ctually configure* the device to be part of the Redundancy Group.

Each Broadband Redundancy Group can only have one Broadband Redundant Module. This device must reside in ***slot 11*** for a configured Broadband 1 Redundancy Group, and in ***slot 7*** for a configured Broadband 2 Redundancy Group. If the device is not in those respective slots or if it has not been configured as a part of the Broadband Redundancy Group or enabled, then the Redundancy Group switchover *will not* occur.

It is important to note here that there is no priority structure to an Redundancy Group. In other words, the first primary card in the Redundancy Group to fail is the one that will be switched. Should another primary card in the Redundancy Group fail while the redundant card is in use, *another switchover will not take place*.

To establish a Broadband Redundancy Group, you must go to the Slot Configuration Menu. Refer to the *System Configuration* chapter in the DXC-100 User Guide for specific details on configuring a slot. For Broadband Group 1, configure slot 11 for the broadband redundant device; and configure slots 8 through 10 with broadband primary devices. For Broadband Group 2, configure slot 7 for the broadband redundant device; and configure slots 1 through 6 with broadband primary devices.

Note

You do not have to configure all of the slots (8, 9 and 10 for Broadband Redundancy Group 1, and 1 through 6 for Broadband Redundancy Group 2) in the DXC-100 nest with the broadband devices but note that any device other than a broadband device will not be recognized as part of that Broadband Redundancy Group, and therefore is not protected.

Configuring a Broadband Redundancy Group is detailed on the following pages.

Configure a Broadband Redundancy Group

1. From the DXC-100 Main Menu, select *System Configuration*, then select *Nest Profile*. The following menu appears:

```
                    Nest #1 : Profile


  Nest name: default node name
  Nest type:.............................: DXC-10011
  Dual System Mgr........................: Yes
  Alarm Contacts Type....................: Standard
  Number of Rings for Modem Auto-Answer..: 2
  Nest Dual Power Supplies...............: No

  N+1 Redundancy Nest....................: Yes
  Protection Switch Dual Power...........: No
  N+1 Redundancy Narrowband Group........: Octal T1/E1
  N+1 Redundancy Broadband Group 1.......: HDS-3
  Protection Switch Dual Broadband Groups: Yes
  N+1 Redundancy Broadband Group 2.......: HDS-3
```

Figure 3-12. The Nest Profile Menu

11. Carefully read each field on this menu, and set up your system based on your equipment and software. To enable redundancy, select *Yes* at the *N+1 Redundancy Nest* field. To enable a second Broadband Group, select *Yes* at the *Protection Switch Dual Broadband Groups* field. *HDS-3* (*DT3 and DE3)* will be the *N+1 Redundancy Broadband Group 1* and *Broadband Group 2* types

available; configure your Broadband Group(s) as appropriate. *Octal E1/T1* (*D8E1T1)* will be the *N+1 Redundancy Narrowband Group* type.

12. Go back to the DXC-100 Main Menu and select *System Configuration*, then select *Slot Configuration*. The following menu appears (*Figure 3-13*):

13. Position the cursor next to the slot you want to configure and press **<Enter>**. The following menu appears:

```
                    Slot Configuration

                          Nest.............: 1
                          Slot.............: 2
                          Slot Name.......: HDS3 #1
                          Card Type.......: HDS-3
                          Redundancy...: Enable
```

Figure 3-13. Card Slot Menu

14. Move your cursor to the *Slot name* field and press **<Enter>**, type in a slot name, and press **<Enter>** again. In the above example, *HDS3 #1* is the named slot.

15. Move your cursor to the *Card type* field and press **<Enter>** to scroll through the card options until the desired card type appears. In the case of a Broadband Group, select *HDS-3* (*DT3* or *DE3)*.

16. Move your cursor to the *Redundancy* field and press **<Enter>** until *Enable* is displayed.

Note

To "enable" redundancy for the Broadband Redundancy Group you must have selected DT3 or DE3 as the card type.

17. To exit and save changes, press **X**. When prompted: "Update Configuration? Are you sure? (Y/N)" press **Y**. You are returned to the Slot Configuration Menu.

Broadband Redundant Device

To view information on the Broadband redundant device in slot 11 (Broadband Redundancy Group 1) or 7 (Broadband Redundancy Group 2), invoke the *Nest Summary Menu.* Position your cursor on the specific broadband redundant device, in this case slot 11, and press **<Enter>**. The following screen appears:

```
                    Main Menu
                    ----------

                Protected Slot: 10

                       View Configuration
                       Diagnostics
                       Utilities
                       N+1 Redundancy
                       About
```

Figure 3-14. Broadband Redundant Device

As you can see from the device's Main Menu, shown in *Figure 3-14*, a switchover has occurred and the DT3 or DE3 redundant device is protecting the DT3 or DE3 primary device resident in Slot 10; the redundant device in slot 11 is view-only. If a switchover had not occurred, that field would read *"none"*. Consequently, if you displayed the slot information for a primary device configured in a Broadband Redundancy Group, the *"Protected Slot"* field would not be there.

From the screen shown in *Figure 3-14*, you can access utilities, view the device's configuration, redundancy state, and display module identification. With the exception of viewing the redundancy state, you can go to the relevant narrowband or broadband device chapter to learn more about the View *Configuration, Diagnostics, Utilities,* and the *About* submenus and their functionality.

N+1 Redundancy State

The following N+1 Redundancy States are available when you configure the slot:

- ***Enable*** - The system will continue to display information about the N+1 Redundancy logic, even though the redundancy state for the specific slot remains enabled.
- ***Disable*** - The cards in a redundant group are no longer actively protected; thus a switchover *cannot* occur.
- ***Freeze*** - Does not permit the N+1 Redundancy logic from updating the system; thus, the last result of the N+1 Redundancy is displayed.

In most cases, there will be a one-to-one correspondence with what you set as the N+1 Redundancy State and the actual state accepted by the DXC-100. In the case where this does not occur, the N+1 Redundancy State is *enabled* and the N+1 Redundancy State reflected on the Nest Summary menu is *frozen* due to a missing Protection Switch cable.

Note *Disable is not a selection under N+1 Redundancy States; however, it will appear on your Nest Summary Menu when you reset your DSMC.2 or power down the Protection Switch.*

For example, ***Freeze*** may be selected as the N+1 Redundancy state, see the slot summary menu in *Figure 3-15*. As long as the system accepts the state, it will be confirmed and appear on the Nest Summary Menu as ***Frozen,*** see *Figure 3-16*. For more information on the *N+1 Redundancy State* field, see the Nest Summary chapter.

```
                    Nest #1 Slot Configuration Menu

Slot# Device Type Name Redundancy
----- --------------- ------ ------------
1 Octal T1/E1 NB Standby Enable
2 Octal T1/E1 Input 1 Enable
3 Octal T1/E1 Input 2 Enable
4 Octal T1/E1 Input 3 Enable
5 Octal T1/E1 Input 4 Enable
6 HDS-3 HDS3 1 Enable
7 HDS-3 BB2Standby Enable
8 STS-1 STS1 1 Disable
9 STS-1 STS1 2 Disable
10 HDS-3 HDS32 Enable
11 HDS-3 BB2Standby Enable

N+1 Redundancy: Freeze
N+1 Redundancy Switchover: Automatic
N+1 Redundancy Restore: Manual
```

Figure 3-15. N+1 Redundancy State Selected

In our example, the *N+1 Redundancy State* field reads ***Frozen***, as shown in *Figure 3-16*.

```
 Databases: NotInSync!!!                        N+1 Redundancy State: Frozen
 Alarm Contacts..: Enabled                      Alarm Contact Type..: Standard
Nest #1 Slot Summary Menu
       N+1
Slot#  Group  Configured Type   Device State   Alarm
-----  -----  ---------------   ------------   -----
01     Nb   + Octal T1/E1        Online         None
02     Nb   - Octal T1/E1        Standby        None
03     Nb   + Octal T1/E1        Online         None
04     Nb   + Octal T1/E1        Online         None
05     Nb   + Octal T1/E1        Online         None
06     Bb-2 + Hybrid DS-3        Online         None
07     Bb-2 + Hybrid DS-3        Standby        None
08            STS1               Online         None
09            STS1               Online         None
10     Bb-1 + Hybrid DS-3        Online         None
11     Bb-1 + Hybrid DS-3        Standby        None
SMCA          System Manager A   Standby        None
SMCB          System Manager B   Online         None
PSX           ProtectionSwitch   Online         None

[C]lear error counts  [T]oggle Alarm Contacts
N+1 Device Redundancy: Switch[O]ver   [R]estore   [E]xpose
```

Figure 3-16. N+1 Redundancy State Confirmed

N+1 Redundancy Switchover

The Protection Switch is capable of being configured to automatically back up narrowband and broadband modules in the DXC-100. The N+1 Device Redundancy (NDRG) Switchover can be configured to occur automatically for one or both types of NDRGs. Although not advisable, the switchover can also be set to *Manual*.

Configure N+1 Redundancy Switchover Options

1. From the DXC-100 Main Menu, select *System Configuration*, then *Slot Configuration*. The Slot Configuration Menu appears:

```
                Nest #1 Slot Configuration Menu

        Slot#   Device Type           Name          Redundancy
        -----   ----------------      ------        ------------
        1       Octal T1/E1           NB Standby    Enable
        2       Octal T1/E1           Input 1       Enable
        3       Octal T1/E1           Input 2       Enable
        4       Octal T1/E1           Input 3       Enable
        5       Octal T1/E1           Input 4       Enable
        6       HDS-3                 HDS3 1        Enable
        7       HDS-3                 BB2Standby    Enable
        8       STS-1                 STS1 1        Disable
        9       STS-1                 STS1 2        Disable
        10      HDS-3                 HDS32         Enable
        11      HDS-3                 BB2Standby    Enable

        N+1 Redundancy:             Enable
        N+1 Redundancy Switchover:  Automatic
        N+1 Redundancy Restore:     Manual

   Change Card = [Enter key]     [D]elete Card     [P]ort/Link
Configuring
```

Figure 3-17. Slot Configuration Menu

18. Move your cursor to the *N+1 Redundancy Switchover* field, and press **<Enter>** until the desired setting is obtained. The possible settings are as follows:
    - *Narrowband Auto* - This setting enables a switchover to automatically occur on just the narrowband devices in a Narrowband Redundancy Group.
    - *Broadband Auto* **1** - This setting enables a switchover to automatically occur on just the primary broadband devices located in slots 8-10 in a Broadband 1 Redundancy Group.
    - *Broadband Auto* **2** - This setting enables a switchover to automatically occur on just the primary broadband devices located in slots 1-6 in a Broadband 2 Redundancy Group.
    - *Automatic* - This setting enables a switchover to automatically occur on an established Redundancy Group.
    - *Manual* - A switchover will not occur until the operator does so manually.

Note

The changes made to the N+1 Redundancy State are recorded dynamically. You must exit the screen in order for your changes to take effect.

19. Once the desired setting is made, press **X** to exit and save.

Note

There is no confirmation screen for this action.

After establishing your Narrowband Redundancy Group, exit the Slot Configuration Menu and go to the Nest Summary screen, see *Figure 3-18*. The Nest Summary screen displays a status of each application module in the nest, the status of the device cards configured for redundancy, the status of the System Manager Controller boards, and the status of the Protection Switch.

```
 Standby SMC not present                        N+1 Redundancy State: Enabled
 Alarm Contacts..: Enabled                      Alarm Contact Type..: Standard
Nest #1 Slot Summary Menu
        N+1
 Slot#  Group  Configured Type    Device State    Alarm
 -----  -----  ---------------    ------------    -----
 01     Nb   + Octal T1/E1        Online          *None      Clock Src
 02     Nb   - Octal T1/E1        Standby         *Major
 03     Nb   + Octal T1/E1        Online           None
 04     Nb   + Octal T1/E1        Online           None
 05     Nb   + Octal T1/E1        Online           None
 06     Bb-2 + Hybrid DS-3        Online           None
 07     Bb-2 + Hybrid DS-3        Standby          None
 08            STS-1              Online           None
 09            STS-1              Online           None
 10     Bb-1 + Hybrid DS-3        Online           None
 11     Bb-1 + Hybrid DS-3        Standby          None
 SMCA          System Manager A   Not Present      None
 SMCB          System Manager B   Online           None
 PSX           ProtectionSwitch   Not Present      None

 [C]lear error counts  [T]oggle Alarm Contacts
 N+1 Device Redundancy: Switch[O]ver   [R]estore   [E]xpose
```

Figure 3-18. Nest Summary Menu

The ***N+1 Group*** column displays the type of group, broadband or narrowband, that you have configured. As stated earlier in this chapter, the DXC-100PSX can support multiple redundancy groups, including multiple broadband groups. Nb is a narrowband redundancy group that can be established in slots 1 through 11, with slot 1 configured as the secondary slot; Bb-2 is a broadband redundancy group that can be established in slots 1 through 7, with slot 7 configured as the secondary slot; Bb-1 is a broadband redundancy group that can be established in slots 8 through 11, with slot 11 configured as the secondary slot.

The pluses (+) and minuses (-) you see displayed on the screen (*Figure 3-18*) distinguish the cards configured as part of an active Redundancy Group and the card that has been switched over.

To qualify for the **(+)**, the configured device type must be correct, the slot redundancy in the Slot Configuration Menu must be *enabled*, the NDR group must have a configured and *enabled* redundant device, and the Protection Switch must be *Online*.

The **(-)** indicates the card is not just a part of an active Redundancy Group but that the device has switched over to the redundant module.

Refer to the Nest Summary Menu in *Figure 3-18*, as noted in the ***Device State*** column, the redundant device in slot 1 is *Online* and actively protecting a failed device in slot 2 of the Narrowband Redundancy Group. In this scenario, the T1/E1 primary device is in *Standby* mode (i.e., waiting to be *Restored)*. A ***Restore*** can only be performed manually by the operator. Additional information on *Restoring After A Switchover* is discussed later on in this chapter. For more detailed information on *Device States* or the *Nest Summary Menu*, refer to the Management chapter of this manual.

Alarms

The Alarm column displayed on the Nest Summary Menu is used to indicate an error or problem(s) with the device or port. Alarm conditions are designated as *Major, Minor*, and/or *Critical.* To discover specific details about the cause of the alarm, press **E** to expose the alarm. For more detailed information on Alarms, refer to the *Alarms* chapter in the DXC-100 User Guide.

On the Nest Summary Menu, next to the *Alarm* column, error conditions are indicated by an asterisk (*) to the left of the status condition. The asterisk is a flag for error conditions such as Bipolar Violations, CRCs, BERT errors, etc. The asterisk can be cleared by pressing **C**. However, as long as errors are occurring, the asterisk will appear on the screen.

The *Toggle Alarm Contacts* field is useful if you have an external alarm panel that can be physically connected to the DSMC.2 rear interface board. If you have an external alarm device, you can enable this feature to invoke an audible or visual notification should an alarm occur. You can disable the alarm from here, as well.

Note *Critical Alarms within a redundancy group will cause a switchover to occur.*

View Narrowband N+1 Device Redundancy Details

1. From the Narrowband redundant device's Main Menu, place your cursor on the *N+1 Redundancy* field and press **<Enter>**. The following screen appears:

```
                N+1 Redundancy Menu
                -------------------

              Protected Slot: 02
              Device Redundancy
```

Figure 3-19. N+1 Redundancy Menu - Narrowband (D8E1T1) Redundant Device

20. Place your cursor on the *Device Redundancy* field and press **<Enter>**. The following display appears:

```
N+1 Redundancy Status Menu


 Member of Redundancy Group: Yes
 Card Type.................: Secondary
 Device State..............: Online

                               State    Change Count
                               --------------------
 Frame Sync Pulse..............: OK             0
 System Clock..................: OK             0
 Backplane Timeslot Management: OK             0
 Communication with System Mgr: OK             0
 Rear Card.....................: OK             0
 Framers.......................: OK             0

[ C]lear counters
```

Figure 3-20. N+1 Redundancy Status Menu - Narrowband (D8E1T1) Redundant Device

From this menu you can view the status of the D8E1T1 device that is established as the redundant device. As shown in *Figure 3-20,* the device is *Online*, which, in this case means the redundant device is passing traffic for the primary card. All events generated are reported under the slot number of the redundant device.

Note

The N+1 Redundancy Status Menu for a Primary Device displays the same fields. The Card Type field is, of course, dependent upon the installed module.

View Broadband N+1 Device Redundancy Details

1. From the Broadband device's Main Menu, place your cursor on the *N+1 Redundancy* field and press <Enter>. The following screen appears:

```
N+1 Redundancy Menu
-------------------

                            Protected Slot: 10
                            Device Redundancy
```

Figure 3-21. N+1 Redundancy Menu - Broadband (DT3 or DE3) Redundant Device

21. Place your cursor on the *Device Redundancy* field and press <Enter>. The following screen appears:

```
N+1 Redundancy Status Menu


 Member of Redundancy Group: Yes
 Card Type.................: Secondary
 Device State..............: Online

                               State    Change Count
                               --------------------
 Frame Sync Pulse..............: OK             0
 Backplane Timeslot Management: OK             0
 Communication with System Mgr: OK             0
 Rear Card.....................: OK             0
 Framers.......................: OK             0

 [C]lear counters
```

Figure 3-22. N+1 Redundancy Status Menu - Broadband (DT3 or DE3) Redundant Device

From this menu you can view the status of the DT3 or DE3 device that is established as the redundant device. As shown in *Figure 3-22,* the device is *Online*, which, in this case means the redundant device is passing traffic for the primary card. All events generated are reported under the slot number of the redundant device.

Note

The N+1 Redundancy Status Menu for a Primary Device displays the same fields. The Card Type field is, of course, dependent upon the installed card.

3.4 Accessing the Main Menu

If you have a Protection Switch coupled with the DXC-100 system and operational, you will be able to access the Protection Switch Main Menu.

Access the DXC-100PSX Main Menu

1. From the Nest Summary Menu, the DXC-100PSX device state should read *Online*. If so, move your cursor to the *DXC-100PSX* field and press <Enter>. The following menu appears.

```
                    Main Menu
                    ---------

                   Status
                   Utilities
                   About
```

Figure 3-23. Protection Switch Main Menu

22. To access any of the menus on the Protection Switch Main Menu, place your cursor on the desired field and press <Enter>.

Table 3-4. Protection Switch Submenu Functions

Submenu	Function
Status	View the status of the Switch box, whether a device has been switched, which slot a redundant device is protecting, and if the device is missing a cable, not present or okay.
Utilities	Reset the device.
About	Displays information about the software release and version, and details about the Interface Module.

3.5 Status Menu

Access the DXC-100PSX Status Menu

1. From the Nest Summary Menu, the DXC-100PSX device state should read *Online*. If so, move your cursor to the *DXC-100PSX* field and press <Enter>. The Protection Switch Main Menu (*Figure 3-23*) appears.
23. From the Protection Switch Main Menu, move your cursor to the *Status* field and press <Enter>. The Protection Switch Status Menu appears:

```
                              Status Menu
                              -----------

Slot#  Card Type              Card Status    Switch State      Switch Status
-------------------------------------------------------------------------
01    Narrowband Redundant     Ok             Switched protect slot 02 Ok
02    Narrowband Primary       Ok             Switched             Ok
03    Narrowband Primary       Ok             Normal               Ok
04    Narrowband Primary       Ok             Normal               Ok
05    Narrowband Primary       Ok             Normal               Ok
06    Broadband '2' Primary    Ok             Normal               Ok
07    Broadband '2' Redundant  Ok             Normal               Ok
08    Broadband '1' Primary    Cable Missing  Normal               Ok
09    Broadband '1' Primary    Ok             Normal               Ok
10    Broadband '1' Primary    Ok             Normal               Ok
11    Broadband '1' Redundant  Ok             Normal               Ok

Power Supply A Status.: Ok        Fan Maintenance: Auto    Fan #01: Ok
Power Supply B Status.: Fault     Fan Speed......: Low     Fan #02: Ok
Chassis Temperature...: 85 F/29 C                          Fan #03: Ok
```

Figure 3-24. Protection Switch Status Menu

The fields contained in the Protection Switch Status Menu are displayed in *Table 3-5*.

Table 3-5. DXC-100PSX Status Menu Field Descriptions

Field	Description
Slot#: (display field)	Displays the slot numbers in the N+1 Protection Switch, from *1* to *11*.
Card Type: (display field)	Displays the type of card installed in the associated slot. It will be one of the following: • *Narrowband Redundant* (slot 1 only) • *Narrowband Primary* (slots 2 to 11) • *Broadband '2' Primary* (slots 1 to 6 only) • *Broadband '2' Redundant* (slot 7 only) • *Broadband '1' Primary* (slots 8 to 10) • *Broadband '1' Redundant* (slot 11 only) • *Card Not Present.*
Card Status: (display field)	Displays the status of the card in the DXC-100PSX. The status will either be *Ok*, *Cable Missing* or *Not Present*.
Switch State: (display field)	Displays the state of the relay switch. The status will either be *Normal* or *Switched*.
Switch Status: (display field)	Used to indicate if there is a discrepancy between the switchover command from DSMC.2 and the position of the relay. The status will either be *Ok*, *Not Present*, *protect slot xx*, or *Malfunction*. If *Malfunction* is indicated, immediately contact RAD Technical Support Department.
Power Supply A Status: (display field)	Displays the status of Power Supply A in the N+1 Protection Switch. It will either register *Ok* or *Fault*.
Power Supply B Status: (display field)	Displays the status of Power Supply B in the N+1 Protection Switch. It will either register *Ok* or *Fault*.
Chassis Temperature: (display field)	Displays the ambient temperature detected inside of the of the N+1 Protection Switch and DXC-100.
Fan Maintenance: (option field)	Sets the fan speed for the N+1 Protection Switch. The available settings are *Auto*, *Low*, *Medium*, and *High*. When the N+1 Protection Switch unit powers up, the fan speed default is *Auto*. The fan speed is based on the temperature inside the N+1 Protection Switch, which is directly related to the surrounding temperature. When the system is at Auto, the fan speed changes automatically depending upon room temperature. When Auto is on, the fan settings are as follows: • ***Low*** - below 30 degrees C (86 degrees F) • ***Medium*** - 30 degrees C (86 degrees F) to 40 degrees C (104 degrees F) • ***High*** - above 40 degrees C (104 degrees F) You can also manually set the fan speed to *Off, Low, Medium* or *High*. **Note:** *Taking the fan out of Auto mode is inadvisable.*
Fan Speed: (display field)	Displays the current fan speed as *Off*, *Low*, *Medium*, or *High*.
Fan #01, #02, #03: (display field)	These fields display the status of each of the fans as either *Ok* or *Fault*.

Cooling Fan Controls

The Protection Switch has a secondary function of providing auxiliary cooling for the DXC-100. There are three fans in the assembly used for the cooling system. The *Fan Speed* field in the Protection Switch Status Menu indicates the speed of the fans in response to the ambient temperature and the status of the fans. When the Protection Switch unit powers up, the fan speed default is *Auto*. The fan speed is based on the temperature inside the Protection Switch, which is directly related to the room ambient. When the system is at Auto, the fan speed changes automatically depending upon room temperature. When Auto is on, the fan settings are as follows:

- Low - below 30 degrees C (86 degrees F)
- Medium - 30 degrees C (86 degrees F) to 40 degrees C (104 degrees F)
- High - above 40 degrees C (104 degrees F)

If the Protection Switch is not in *Auto* mode, you can set the fan speed directly to *Off, Low, Medium* or *High*.

An alarm will occur if one of the following conditions is present:

- *cooler* - the fan will throttle down when the temperature cools.
- *fan problem* - if there is a problem with one of the fans, an alarm will occur.

Note

Taking the fan out of Auto mode is inadvisable.

Change the Fan Setting

1. From the DXC-100 Nest Summary Menu, place your cursor on the *DXC-100PSX* field and press <Enter>.

24. From the Protection Switch Main Menu, place your cursor on the *Status* field and press <Enter>. The following menu appears:

```
Status Menu
 -----------

 Slot#  Card Type               Card Status    Switch State    Switch Status
 ------------------------------------------------------------------------------
 01     Narrowband Redundant     Ok               Normal               Ok
 02     Narrowband Primary       Ok               Normal               Ok
 03     Narrowband Primary       Ok               Normal               Ok
 04     Narrowband Primary       Ok               Normal               Ok
 05     Narrowband Primary       Ok               Normal               Ok
 06     Broadband '2' Primary    Ok               Normal               Ok
 07     Broadband '2' Redundant  Ok               Normal               Ok
 08     Card Not Present         Not Present      Not Present     Not Present
 09     Card Not Present         Not Present      Not Present     Not Present
 10     Broadband '1' Primary    Ok               Normal               Ok
 11     Broadband '1' Redundant  Ok               Normal               Ok

 Power Supply A Status.: Fault      Fan Maintenance: Auto     Fan #01: Ok
 Power Supply B Status.: Ok         Fan Speed......: Low      Fan #02: Ok
 Chassis Temperature...: 85 F/29 C                            Fan #03: Ok
```

Figure 3-25. Protection Switch Status Menu

25. Place your cursor on the *Fan Maintenance* field and press <Enter>. Toggle between the following options to change the fan's speed:
    - Auto
    - Off
    - Low
    - Medium
    - High.

    As you toggle between options in the *Fan Maintenance* field, the corresponding option will appear in the *Fan Speed* field (it will take approximately 2-3 seconds for the corresponding option to appear). The only option that will not correspond is the *Auto* option. The Fan Maintenance field will indicate *Auto* while the Fan Speed field will register either *Low, Medium* or *High*. The speed setting is chosen automatically by the controller card, with the setting dependent on the temperature of the environment in which the Protection Switch is located.

3.6 Utilities Menu

The DXC-100PSX Utilities Menu allows you to re-initialize the Protection Switch Controller Card as done upon power up.

During this boot up cycle, no user data will flow. Since the configuration resides on the DSMC.2, the current N+1 Redundancy setup will be restored.

Reset the Protection Switch Controller Card

1. From the DXC-100 Nest Summary Menu, place your cursor on the *DXC-100PSX* field and press **<Enter>.**

26. From the Protection Switch Main Menu, place your cursor on the *Utilities* field and press **<Enter>**. The following menu appears:

```
                    Utilities Menu
                    --------------

                      Reset Board
```

Figure 3-26. DXC-100PSX Utilities Menu

27. With your cursor on the *Reset Board* field, press **<Enter>**. The following prompt appears:

```
                    Utilities Menu
                    --------------

   ************************************
   *                                  *
   *             -MESSAGE!-           *
   *                                  *
   *                                  *
   *          Reset this Card?        *
   *                                  *
   *                                  *
   *        Are you sure (Y/N)?       *
   *                                  *
   ************************************
```

Figure 3-27. DXC-100PSX Reset Card Prompt

28. Press **Y** to reset the DXC-100PSX Controller Card. A message appears stating: "-ALERT!- Please wait while we establish communications with the system manager! Press any key to continue."

29. Press any key. If this does not return you to the previous menu, press **<Ctrl>** and the **C** key simultaneously.

The Switchover Command

The DSMC.2 controls the NDR and determines that a switchover is necessary. The DSMC.2 directs the switchover to the redundant device in the Redundancy Group. Once the switchover occurs, the ports lose traffic. While the redundant device is in use, no other primary device failures can be switched. The primary device's configuration is copied to the redundant device. The primary device's configuration is preserved.

Manual Switchover

A switchover can be executed if the operator wants to take the primary card offline for maintenance purposes.

The Switchover command, performed by the *Administrator*, *Provisioning* or *Test* level user (refer to the System Configuration chapter for a description of user levels), forces the primary device to switchover and go *offline*.

To perform a manual switchover, go to the *Nest Summary Menu*, place your cursor on the primary device slot, and press "O". A switchover done in this manner is referred to as a *manual switchover*. The next two screens are representative of a succession of screens that show a switchover in progress and a successful switchover. Press X to return to the previous menu.

```
                    Switchover command state

Nest 1 Primary Slot 10 Secondary Slot 11

Switchover: Secondary card arming in progress
.
```

Figure 3-28. Switchover in Progress

```
                    Switchover command state

Nest 1 Primary Slot 10 Secondary Slot 11

Switchover: Successful
```

Figure 3-29. Switchover Successful

Automatic Switchover

To enable the *automatic switchover* function, you must go to the Slot Configuration Menu and set the N+1 Device Redundancy Switchover command to *automatic*. In this case, a switchover will occur automatically, without user intervention.

A switchover occurs when a primary device in an Redundancy Group has failed and met one or more of the error conditions described in *Table 3-6*.

Table 3-6. Error Conditions That Cause Switchovers

Error Conditions	Switchover Occurrence
Frame Sync pulse: Missing (bus error)	A frame sync pulse error occurs when there is a problem from the SMC by sending a wrong pulse or the device is not receiving the pulse correctly
System Clock: Missing (bus error)	The system clock is lost
Backplane Timeslot Management: Invalid (bus error)	The backplane is inundated with too many timeslots
Communication with System Manager: Lost (bus error)	The device has not received any messages from the SMC and the device responds that it is not present
Rear Card: Missing (bus error)	Rear card is not detected. The device will reset once the rear card has been detected
Framer: Bad (general error)	A framer is bad. There is a mismatch between the current value read from the hardware and the values recorded by the software

Restoring after a Switchover

Restoring can only be accomplished *manually* via the Nest Summary Menu. When a previously offline primary device is in standby mode, the *Restore* command forces the selected device to online.

If the selected device can not be restored (i.e., switched over) an error message will appear on the screen and no other action will occur.

3.7 About Menu

The DXC-100PSX *About Menu* displays information about the DXC-100PSX rear card hardware revision levels and the software and hardware revision levels for the Protection Switch Controller Card.

Access the DXC-100PSX About Menu

1. From the DXC-100 Nest Summary Menu, place your cursor on the *DXC-100PSX* field and press **<Enter>**.

30. From the Protection Switch Main Menu, place your cursor on the *About* field and press **<Enter>**. The following menu appears:

```
                                About Menu
                                ----------

Slot#    Rear Card Rev
======================
01       1                  Software Version.........: 2.4a
02       0                  Software Release Date....: July 2, 2003
03       1                  Software Checksum........: 6FC1
04       1
05       1                  PSX Controller Card......: Rev 1
06       0                  PSX Backplane............: Rev 1
07       0                  Multi-Broadband Groups...: Enabled
08       Not Present
09       Not Present
10       0
11       0
```

Figure 3-30. DXC-100PSX About Menu

Field Descriptions for this menu are provided in *Table 3-7*.

Table 3-7. DXC-100PSX About Menu Field Descriptions

Field	Description
Slot #: (column)	Displays the slot number of the DXC-100PSX rear cards.
Rear Card Rev: (column)	Displays the hardware revision level of the DXC-100PSX rear cards.
Software Version: (display field)	Displays the software version currently residing in the DXC-100PSX Controller Card's flash memory.
Software Release Date: (display field)	Displays the date of the PSX Controller Card's module software release.
Software Checksum: (display field)	Displays the sum of all bytes in the PSX Controller Card's flash memory at power up. Also used to identify software version.
PSX Controller Card: (display field)	Displays the hardware revision level of the PSX Controller Card.
PSX Backplane: (display field)	Displays the hardware revision level of the DXC-100PSX backplane.
Multi-Broadband Groups: (display field)	Displays whether Broadband Group 2 functionality is *Enabled* or *Disabled*.

Appendix A

Replacing the DXC-100PSX Fan

A.1 Scope

The Protection Switch can detect a change in fan speed. The slow condition could be due to a failure of a fan such as worn bearings, open winding in the motor or shorted winding in the motor. If a fan fails, the entire fan assembly unit must be replaced.

Note

Before removing the fan assembly, make sure the fans are turned off. Refer to the procedure on changing the fan setting.

A.2 Fan Assembly Replacement Procedure

1. From the Protection Switch Main Menu, select the *Status* field and press <Enter>. The Protection Switch Status Menu appears.
2. Place your cursor on the *Fan Maintenance* field and press <Enter> to toggle between the options. Change the setting to *Off*.
3. Locate the grille containing the filter on the front of the Protection Switch. Unscrew the four screws on the grille and remove the grille from the Protection Switch.
4. Turn the four knurled nuts counter-clockwise to remove the fan assembly.

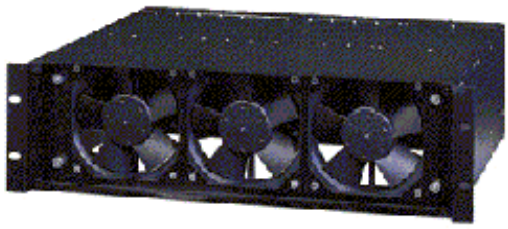


Figure A-1. Front View of Fan Assembly

5. Disengage the fan connector from the PC board and pull out the defective fan assembly.
6. Engage the replacement fan assembly connector to the PC board, making sure it is properly connected.

7. Place the replacement fan assembly into position making sure the wiring is clear of the Protection Switch chassis. Line up the fan assembly unit with the threaded bolts. Turn the knurled nuts until tight.
8. Replace the grille assembly.
9. Go back to the Status Menu, scroll down to the *Fan Maintenance* field and press <Enter> to change the fan position to *Auto*.

Note *If a fan fails, the entire fan assembly must be replaced.*

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Thank you for your assistance!

Manual Name: DXC-100PSX Ver. 16.2

Publication Number: 371-210-05/10

Please grade the manual according to the following factors:

	Excellent	*Good*	*Fair*	*Poor*	*Very Poor*
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